

# President's Message

Well, it is almost that special time of year again time for another SEPA conference. It doesn't seem that long ago we were meeting in Roanoke. I hope everyone is making plans to attend this year's conference in Jacksonville, Florida. Patrick McQuillen and staff have been working hard and have some great activities planned.

This is the time of year I always look forward to. There is nothing like sharing ideas and experiences with your friends and colleagues. I always learn something new at every SEPA conference. Isn't that what it's all about anyway?

Jacksonville has a lot to offer us, and I guarantee you will not be disappointed. I don't know exactly which tour Patrick is trying to line up at the Kennedy Space Center, but I do know it will be more than your average tourist visit. In addition, there are a lot of speakers; paper sessions and workshops lined up that I am looking forward to.

This is an important time for vendors also. We can not produce a quality conference without their support. Technology is creating a lot of change in our field and I look forward to learning more about what our vendors have to offer. I hope you are looking forward to the conference as much as I am.

I would also like to thank all the members who sent in their postcards for their speedy response to the polling we conducted in the last issue of Southern Skies. The response was phenomenal, and most everyone agreed that council should begin working on the logistics of a joint GLPA/SEPA conference to be held in June of 2001.

Jack Fletcher, of Eastern Kentucky University's Hummel Planetarium, has made a formal offer to host the conference the week of June 26 - June 30, 2001. Typically, GLPA meets in October, so we are honored that they are willing to change their meeting date in order to meet with us.

Yes, we know that there is a total solar eclipse on June 26, 2001 across Africa. GLPA and SEPA Councils agree that this will effect only a few members. Not everyone can afford to travel to Africa and

even fewer can afford an eclipse trip and a major regional conference in the same calendar year. Besides, as Duncan pointed out in a recent discussion of this topic with council, isn't a joint GLPA/SEPA conference more rare than a solar eclipse?

There are a lot of logistics that must be worked out between the two regional associations. Even though we both do things in similar ways, we still have some major differences. None of these differences procedure is insurmountable, however, and we look forward to working with GLPA to make this joint conference a reality.

Mark your calendars for 2001, but don't forget next year's conference (year 2000) at Duke Johnson's dome in Winston Salem, North Carolina! I am sure that will be a great conference too.

Council is also working on a possible mini show (5 - 7 minutes) to be distributed among the membership free. This program could be added to the beginning or to the end of any star show and could be a great way to help promote proper lighting techniques.

We are working closely with the International Dark Sky Association (IDA) on an infomercial style program dealing with the effects of light pollution. We hope to use this project as a stepping stone to produce a longer, full length, production on some astronomical topic in the future. We are currently working out the logistics, and we will have a full report of our progress at the conference in Jacksonville. See you

George Fleenor  
President  
Bishop Planetarium  
Bradenton, FL



# IPS Report

John Hare  
IPS Representative

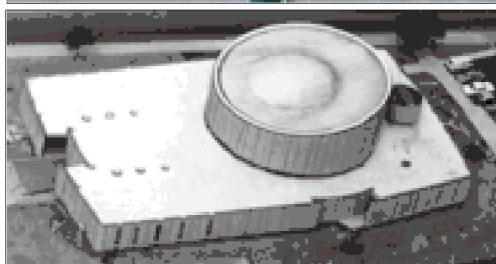


Now is the time to begin planning if you are thinking about attending the next IPS conference. IPS 2000 will be hosted by the Planetarium de Montreal, July 9-13, 2000 in Montreal, Canada. This will be the closest IPS site to our region until at least 2004 since the IPS conference in Cocoa in 1994. Having been to past IPS conferences, I can attest to the advance planning aspect. The conferences usually are held in locations that have a number of other attractions. Hotel rooms, rental cars, airline tickets, tour bookings, etc. are much easier to find and often less costly if you plan and book early. Check out the IPS 2000 conference Web site under development at the planetarium's home page <<http://www.planetarium.montreal.qc.ca/IPS2000/index.html>>. Don't forget the French language tapes!

O'Keefe Breweries (now known as Molson O'Keefe). It was through his impetus that Dow Breweries decided to endow Montreal with a world class planetarium, add to the city's touristic appeal, and to the 1967 World's Fair.

Plans for the Planetarium were developed by the architectural firm of David Barott Boulva. The innovative design echoed an astronomical theme, evidenced by the exterior of the dome which resembles Saturn surrounded by its rings. The Planetarium was built at a cost of 1.2 million dollars and located on Chaboillez Square which once served as a parking area. In February 1966, the building and its projection equipment was ready as several lecturers busily prepared for the inaugural show, *New Skies for a New City* which premiered on April 4, 1966. In the past thirty years, the Planetarium has produced more than 200 shows, attended by nearly five million spectators; and 50 lecturers have given more than 43,000 presentations in the Star Theatre.

Today, as yesterday, the Planetarium continues to disseminate scientific and astronomical information to the public.



## History of the Host Planetarium

The Montreal Planetarium, previously known as the Dow Planetarium, was inaugurated on April 1, 1966 by Mr. Jean Drapeau, who was Montreal's mayor at the time. This event marked the culmination of more than three years of planning and hard work by Dr. Pierre Gendron, who was past professor of chemistry and founding dean of the faculty of science at the University of Ottawa, and an avid amateur astronomer.

At the time, Dr. Gendron was also president of the board of directors of Dow Breweries, which later became



Left top and middle: aerial views of the Montreal Planetarium showing it was designed to look like Saturn surrounded by its rings. Left bottom: the Zeiss star projector. Right top and bottom: Graphic images from two current star shows, *Asteroids* and *Lost in Space*.



# (Amazing) Grace Period

## It's All Over Now

Okay. The grace period is over. If you don't pay your dues after receiving this issue of Southern Skies, you'll have to pay at the Jacksonville conference or else be in the dark for the rest of the year.

About two thirds of last year's membership has paid their dues and rejoined SEPA so far. We have sixteen complimentary issues mailed out either to vendors who have made contributions to our annual conference or to regional affiliates with whom we supposedly exchange publications. Now if they would only exchange with us.

Does your parent organization pay your dues? Will you please let them know that SEPA's taxpayer identification number is on the invoice? A couple of entities have asked me to fill out a backup withholding form they ask vendors to complete. (Is your professional organization a vendor?)

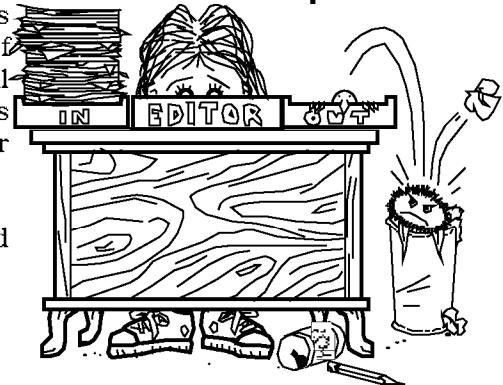
I bill them for the time it takes me to fill out the form and for the postage required to return it. Like all good bureaucracies, they pay without questioning. Consider paying your own dues and requesting reimbursement from your own bureaucracy.

On a lighter note, SEPA members surely do contribute toward making the editor's job lots easier. Our members submit some wonderful technical articles; regular and creative information columns; software, video, and book reviews; reports on the activities of other professional organizations, news pertaining to their facilities, and how to features.

I'm very pleased that our publication has more content within its pages than announcements of positions available, news releases, and officers messages. It's all possible because we have such dedicated members who are willing to share their expertise with their colleagues.

It's much more fun to spend my time composing Southern Skies than calling or

Duncan R. Teague  
Secretary/Treasurer  
Southern Skies Editor  
Craigmont Planetarium  
Memphis, TN

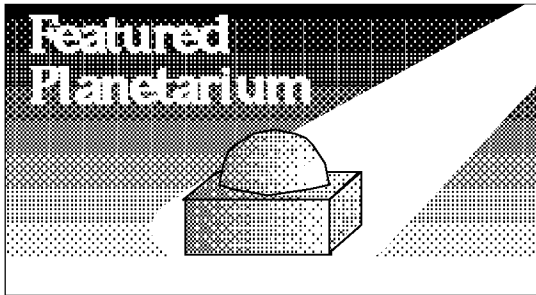


Mike Cutrera

Send your \$25.00 check made payable to SEPA to the following address:  
Craigmont Planetarium, 3333 Covington Pike, Memphis, TN 38128 3902

Name		
Planetarium		
Organization		
Address		
City		
State	Zip	
Area	Voice	
Area	Fax	
Position		
E-mail address		

# Featured Planetarium: Alexander Brest Planetarium, Jacksonville,



Dave Hostetter  
Featured Planetarium Ed.  
Lafayette Natural History  
Museum & Planetarium  
Lafayette, LA

Author  
Patrick McQuillen  
Director  
Alexander Brest  
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Jacksonville, FL  
PatAstro@aol.com

Jacksonville, Florida's Museum of Science and History's Alexander Brest Planetarium is named for Mr. Alexander Brest. Mr. Brest was a local philanthropist who donated the money to build the current planetarium. He recently died after living to the ripe old age of 101.

The Alexander Brest Planetarium opened in the fall of 1998. The Planetarium has a 60 diameter dome, 215 unidirectional seats, video projection (60 diagonal screen), an allsky system, cross fading seven section panoramas (25% overlap), several slide projector stacks that are 3 deep, and at least one of every special effect projector ever made by Sky Skan.

Jena, the East German branch of Zeiss, made the planetarium's star projector. Jena is now reunited with Zeiss into one company. The projector is a Jena DP3. Only seven of this particular model were ever made. We have the only one in the western hemisphere. The most famous of the seven was destroyed by retreating Iraqi soldiers who burned the Kuwait planetarium and museum so that it would not be usable by the citizens of Kuwait.

The Jena DP3 projects 8,900 stars. There are all the usual projectors on the instrument (i.e., ecliptic, equator, meridian, bright planets, Sun, Moon, etc.) But there are a few not so usual ones too (cloud projector, world map, sun rise/sunset glow). The instrument can move in diurnal, latitude, annual, precession, and azimuth motions.

Previous to the current planetarium, the Museum of Science and History had a 40 foot diameter planetarium with a Minox MS 10. The Mark Smith Planetarium in Macon, Georgia is currently benefiting from that star projector in their theater. Their planetarium instrument went to a museum in northern Georgia. Our 40 foot dome will be traveling to that museum this fall as they build a new building that can house the dome and star projector. So it really is a small world after all. The old dome is still in place, but the theater seats have been removed. The room now serves as a meeting/classroom. We plan on having the large starlab set up in this room during the 1999 SEPA conference.

Many familiar names in the planetarium field have worked at the Museum of Science and History in one of these two planetariums. I'm sure you know these folks: Phil Groce, Kris McCall, Dr. Mike Reynolds, Gavin Hoffman, and Patrick McQuillen. Some folks you may not know work in the current planetarium: Kristin Lester, Jeff Potter, Alisa Barber, Sheree Pendleton, and Patrick McQuillen. You will get a chance to meet these wonderful staff members if you attend the 1999 SEPA conference.

The planetarium's systems are always being updated (as budgets allow). The Joe Hopkins Engineering (JHE) Screenmaster



and Microstar system have been running our automation systems since 1995. All programs are recorded on ADAT, and SMPTE time code advances the slides, lighting, and special effects cues. JHE's Brightstar automation system is installed to run our Jena DP3, lights, and special effects projectors. It replaces the original Jena RFP control system. This system was very advanced for its time in 1987. It ran a DOS type operating system that controlled the functions of the Jena DP3. To give you an idea of why it was replaced, it ran the operating system off of 8 inch floppy disks. JHE's Brightstar system replaced 2 consoles the size of your office desk with a control panel that would fit on the top of your desk. And parts are slightly easier to get.

Video projection is accomplished via a Sony 1040 3 gun video projector. We can project laserdisc, VCR, cable TV, or computer images on the dome. The video projector is in the cove over the console and shoots across the dome. This gives us a very large 60 foot diagonal image. The resolution is not good enough to read small text, but it works well enough to provide big planet images (like those on the Sky Skan laser discs) during programs. We have the ability to put NASA Select on the dome for use in programs. Since we are less than three hours from the Kennedy Space Center, our visitors have a keen interest in following the space program. You tend to be this way when you can see shuttle launches from your backyard on clear days and nights! We often show shut

tle launches and have mission updates for both school and public programs. A recent school group thanked me for arranging to have the shuttle launch occur during their school program hour. I do what I can.

In what is the only public school system/ museum collaboration of its kind, the Museum of Science and History manages the Duval County School Board Challenger Learning Center. The Challenger Center is owned by the school system. They have contracted with us to staff the Center. Every sixth grader in Duval County (Jacksonville) is required to attend one mission in the Challenger Center during the school year as part of their sixth grade graduation requirements. We have over 10,000 sixth graders. The Challenger Center can hold 32 students per 2 hour program. So do the math; we present tons of programs each year. The Challenger Learning Center is physically located in one of the school system middle schools. This school is a science and math magnet school. The school is located about ten minutes from the Museum. One of the workshops at the SEPA conference is an overview of the Challenger Learning Center program.

There are a million other things that we do in the course of a year in and around the planetarium. Evening observing events for lunar eclipses and comets, offsite meteor watches at local state parks, special event weekends for National Astronomy day, summer camps, weekend workshops, etc, etc, etc. We hope to see everyone at the SEPA conference this summer. Come enjoy some Florida hospitality and we can com

miserate about late groups and other universal planetarian woes.



# Small Talk

Elizabeth Wasiluk  
Small Talk Editor  
Berkeley County Plan-  
etarium



I was greatly saddened to hear of Gary Close's death in the last issue. I have fond memories of working with him to get us lunch at Green Bank. Also I'll never forget the standing ovation he got from us as a response to the absolutely wonderful performance he threw for us in Roanoke last year. He will be truly missed.

With thirteen hundred students at our school, you'd think I could find fifteen who would be interested enough to take an introductory astronomy class, but alas, I spend more time referring chronic skippers for detention than correcting telescope labs. It seems that at the beginning of the year I get

kids who haven't bothered to fill out any course requests and when someone asks "What would you like to take? Would you like to take astronomy?" They usually answer, "I don't care, I don't know, and somehow they turn up in my class. So much for those people who think I have a wonderful job! [You do have a wonderful job. You could be in a regular, rectangular classroom with a chalkboard, an overhead projector, and upwards of 40 juvenile delinquents! Ed.]

So with those two downer messages, I needed something to make me smile, so I thought I'd contact people via phone and asked them to let me know the answer to this non-skill testing question. Complete this statement, "You know it is going to be a bad day in the planetarium when..."

Now before I start, I'd like to thank the brave souls who allowed me to use their names in this column, but there were many who would not, for whatever reason, so here is my totally unrandom, unscientific study.

Conrad Jung of the Chabot Science Center and Observatory in Oakland, CA had the misfortune to call me when I was beginning the inquiry and responded the following way:

You know it is going to be a bad day in the planetarium when you see over 100 seven year olds waiting in line to enter your facility and they have all just devoured a large birthday cake. I guess this has

happened several times and it usually spells trouble, if not sticky hands, then kids bouncing off of the walls on a sugar high.

Carole Helper of the Mark Smith Planetarium in Macon, GA completed the statement this way:

You know it is going to be a bad day in the planetarium when you see a line of strollers outside your planetarium door. Carole reassured me that she is not a child hater. It seems that despite her planetarium's policy of not allowing children under a certain age to the main feature program, there are people who insist that their child is really an angel in disguise and has never cried



in his or her life. Yet it always seems when Carole relents and allows them to come in, most times they leave howling, or worse, they keep wailing and don't leave.

Another anonymous comment came from someone who claimed their bad day started during a canned star show where an obviously pregnant woman made her way to the console board to say she needed to get out in a hurry and to call an ambulance. Luckily she had a false alarm and the baby was not born while travelling to another planet.

Another person, who also would not leave a name, had a neat one. I'm sure everyone can relate to this story:

You know it is going to be a bad day in the planetarium when a brand new assistant greets you and says, I spent all morning realigning the pan system. Now they don't overlap anymore and there is a nice dark space between each slide in the pan. They reassure me this was a true occurrence.

When I was at J. M. McDonald Planetarium in Hastings, Nebraska, I finished the statement this way:

You know that it is going to be a bad day in the planetarium when you notice water dripping out of the power box. Yup, this happened to me. It seems this leak in the roof developed right over the main switcher box. Luckily, it didn't damage anything and I had it fixed before it rained again.

Later that same year, I would have finished the statement this way:

You know it is going to be a bad day in the planetarium when you turn on the key switch and you get zapped.

I guess a power wire was leaning the wrong way and zappo. Luckily we soon got a new console board and fears of getting zapped ended.

Jim Greenhouse of Mark Smith Planetarium in Macon, GA had another idea:

You know it is going to be a bad day in the planetarium when you turn the key switch on your console and nothing happens. This is better than getting zapped, but still makes a bad day.

You know it is going to be a bad day in the planetarium when you arrive at work the day before the opening of the big new show you've been promoting for weeks, only to see the building roped off and someone telling you that you cannot enter as there has been a dangerous chemical spill. No one is being allowed in the building for what could be months. Rumours abound that this really happened to someone in SEPA land.

How about this one:

You know it is going to be a bad day in the planetarium when you arrive at work and there is a message that says, You are being temporarily reassigned to another department, and it isn't the planetarium. I found this out about someone I tried calling the other day.

How about the following:

You know it is going to be a bad day when you show up at work and there is a SWAT team on your roof, complete with pointing rifles. I kid you not, this actually happened when I worked at the Bishop Planetarium in Bradenton, FL. It seems a nearby bank was being robbed, and, in the process, the bank robber nabbed hostages, and the SWAT team positioned itself on the nearest tall building which happened to be the planetarium. I'll bet John Hare has some pictures in his archive.

Another time it looked to be a bad day at Bishop Planetarium when I came down from the observatory, only to see people mopping up blood and carrying a person out on a stretcher to a waiting ambulance. It seems a scuffle occurred when the guy at the end of the line didn't get a laser ticket and pulled a knife on the person who did in line in front of him.

Probably the worst one I could think of is this one:

You know it is going to be a bad day in the planetarium when you smell that awful smell of melted vinyl, plastic, etc. When the fire hit the Buffalo State College Planetarium in Buffalo, NY, I vowed I would never walk into the room to view the damage. I didn't have to. The first day back after the fire, I could smell it from a long way off. You didn't tell me it was going to smell bad! I cried. This story, however, has a happy ending. From the ashes of the fire arose the Whitworth Ferguson Planetarium, named after the electrical contractor who helped donate money to get it rebuilt.

Jim Greenhouse, from Mark Smith Planetarium in Macon, GA had a twist on this one. His idea of a bad day would be when smoke comes out of your star projector. That would probably make a bad day in anyone's dome.

So there is a little something to post near your desk at work in case you think you are having a bad day, somebody else is probably having a worse one. Drop me a line if you have anything to add.

Just a short note that our address changes as of April 1, 1999: Hedgesville,

# Digital Cosmos

## 3-D Tour of the Solar System



Erich Landstrom  
Digital Cosmos Editor  
South Florida  
Science Museum  
West Palm Beach, FL

### 3 D Tour Of The Solar System

- Three dimensional images of the planets, their satellites, asteroids, and the Sun
- Created by Paul Schenk, David Gwynn, and James Tutor
- Lunar and Planetary Institute/ Universities Space Research Association

### Cost

Suggested Retail Price: \$24.95

### PC Requirements:

80486 processor or higher; Windows 3.1 or Windows 95; 8 Mb RAM; 10 megabytes hard disk space; 2X CD ROM drive; 8 bit display

### MacOS Requirements:

68040 or PowerPC processor; System 7.0  
8 Mb RAM; 10 Mb hard disk space; 2X

CD ROM drive; 8 bit display

Website:

<[http://cass.jsc.nasa.gov/research/stereo\\_atlas/SS3D.HTM](http://cass.jsc.nasa.gov/research/stereo_atlas/SS3D.HTM)>

The best possible way to judge The Lunar and Planetary Society 3 D Tour of the Solar System is to preview it for free on their Website. This is stated not out of dereliction of duty as software reviewer, but because the material on the 3 D Tour CD ROM is in hypertext mark up language format. Any World Wide Web browser compatible with HTML 3.0 or higher on Windows, MacOS, and Unix workstations using either Netscape or Internet Explorer (although for optimum viewing, the browser must support frames) can display 3 D Tour.

If you don't have a browser, Microsoft's Internet Explorer 3.02 is provided on the disc. Two conclusions can immediately be drawn: 1., there is enormous strength and flexibility in the ability to run off of any operating system; no matter what you have, you can almost certainly run this disc, and 2., surfing the LPI 3 D Internet site shows you almost exactly what to expect for your twenty five dollars.

Expect a concise tour, not a comprehensive tour de force, from the 160 3 D images of solar system bodies. The 3 D effect is achieved by the old red and blue method: two similar pictures of an object taken from a slightly different positions or orientations, one colored red and the other colored blue and green, are overlapped so that while wearing red blue glasses, the brain combines the two images to produce a 3 D image.

Most of these stereo views are derived from photos and images taken by NASA astronauts and unmanned space probes. There are no QuickTime type movies or animations of fly overs.

There are two methods of browsing the image collection: by taking the Planet Tour, or by taking the Geology Tour.

The Planet Tour explores





the following choices of planetary body: The Sun; Mercury; Venus; Earth; The Moon; Mars and Phobos; asteroids Ida, Gaspera, and Toutatis; Jupiter and three Galilean Satellites; Saturn and its satellites Dione, Rhea, Hyperion; three moons of Uranus (Miranda, Ariel, and Titania); Neptune's moon Triton; Pluto and Charon.

The Geology Tour allows you to compare and contrast similar geologic and atmospheric features as they exist on different planetary bodies. This includes volcanos, craters, faults and tectonics, clouds and storms, rivers, and exploration of the Moon during the Apollo missions and of Mars during the Viking and Pathfinder missions.

Expect the writing style of the tour as a whole to be succinct and scholarly, but where most

tours are a Sunday drive, 3 D Tour is a safari. Most of the stereo images include a table of scientific data, some brief but very pertinent topographical descriptions, a fairly extensive glossary of geological terms, and a list of supplemental reading materials.

Clicking on Description and Data Sheet provides a small 3 D image and an encyclopedia type introduction. Clicking on Features of Interest can bring up the image with a color coded overlay to illustrate many different and specific features. Clicking on Regional View backs off the view to place the object in some non 3 D frame of reference or context (for example, compared to other satellites, or by zooming out to show more terrain). Clicking on Full size View brings up the largest resolution of the 3 D image to fill the screen.

Expect some omissions that keep this from being a thorough tour. This surprised me, because the pictures are available

for processing and would greatly benefit from a 3 D view. There is not a single image of an individual sunspot, solar flare or example of solar granulation. There not a single snapshot of Europa's ice sheets, despite the Galileo's spacecraft's stunning imagery. There are no close ups of Saturn's rings. And the tour does not include a single image of Uranus, Neptune or a comet. The overall navigation of the disc is also somewhat circuitous, in my opinion, but the ease of Web based browsing compensates.

Expect to supply your own 3 D glasses. The 3 D viewer provided measures 3 by 1 (9 cm by 4 cm). For me, this is too small for easy viewing. You can order full sized 3 D glasses from one of the vendors listed at the following Web address:

<http://photojournal.jpl.nasa.gov/Help/VendorList.html#Glasses>.

Otherwise, my expectations with 3 D Tour were met and sur



passed. This surely must be the next best thing to being there. The stereo images allowed me to see familiar photos in a new dimension.

The Tour will be installed as a permanent exhibit at the South Florida Science Museum this summer. I expect it to be widely popular. For use in school programs, the high school level Planet Tour and the university level Geology Tour have an added dimension. You could say 3 D Tour puts space into outer space.

# The Planetary Scientist's Companion

Patrick McQuillen  
Book Review Editor  
Alexander Brest  
Planetarium  
Jacksonville, FL



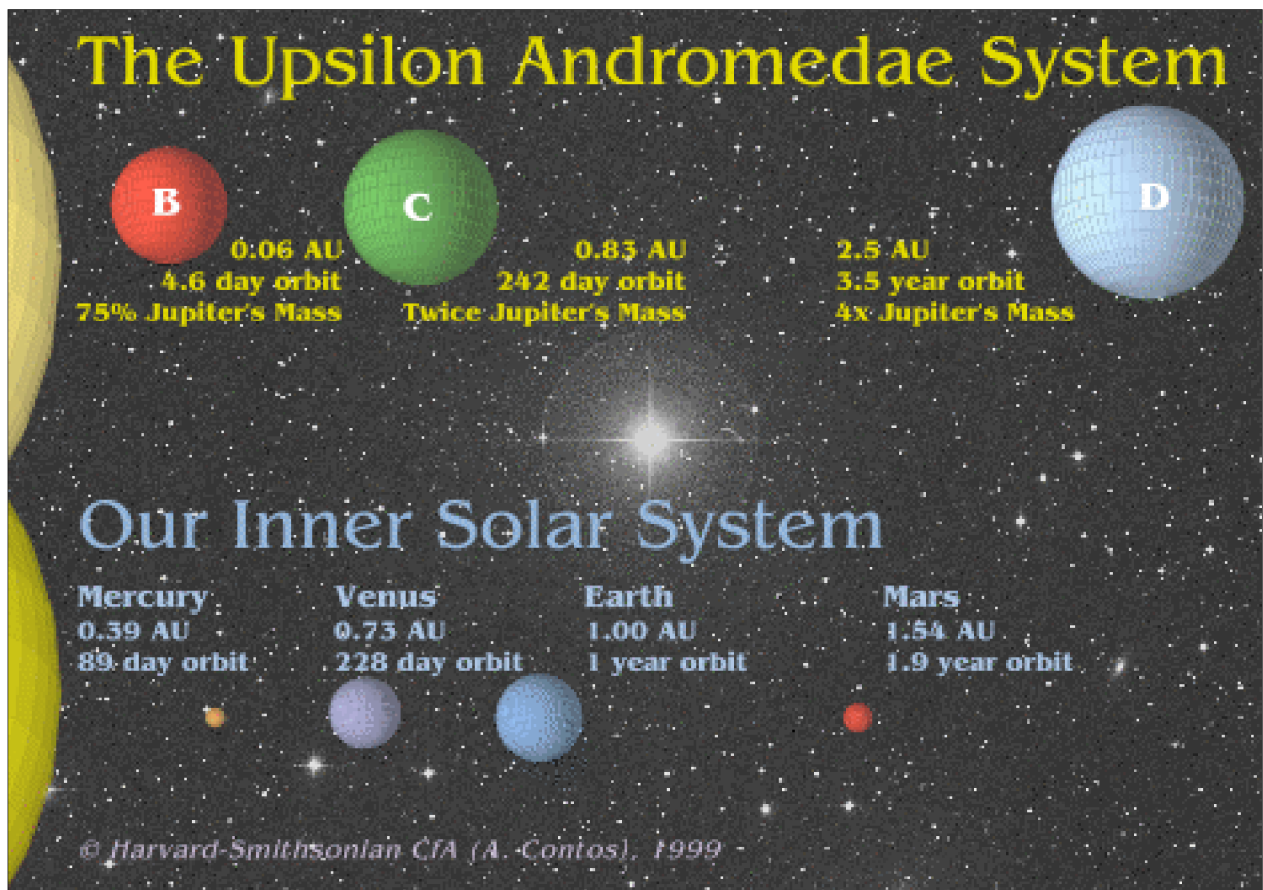
Every now and then a book comes across my desk that I don't have much use for and that I don't have much of an interest in reading. This book sort of falls into that category. I didn't care to read this book not because it was a topic I'm not interested in or because it seemed boring. Mostly I wasn't too interested in reading this book when I first got it because the very nature of the book is such that you cannot read it. It is not a text in novel format like the story of Apollo 13, or a biography of astronomer Edwin P. Hubble.

This book consists mostly of charts and tables of infor

mation. So I guess you could read from cover to cover if you had a lot of free time. It isn't, however, intended to be used in that manner. It is intended to be a reference source, and as a reference source it does a terrific job.

I did not have much use for this book when I first received a copy because we were busy installing a new public planetarium program. So a book with tables of information didn't catch my attention until the week after our star show opened to the public. A new set of planets had been discovered around the star Upsilon Andromedae. I knew I would get a few calls from the news media and from the public in general. I also knew folks would ask, How many other extra solar planets have been discovered? Where are these planets located in the night sky? What properties do they have?

Remembering that I had this book, I reached over to it, flipped through the table of contents, and sure enough, there



was the information I needed. Chapter 17 Beyond the Solar System: Table 17.7 Properties of low mass substellar objects (extra solar planets and brown dwarfs) and comparison to Jupiter was just the set of data I wanted.

When the calls came in, I was able to discuss extrasolar planets without having to say anything like, I think all the stars with suspected planets are like pulsars and stuff, but I would have to check.

That is the beauty of The Planetary Scientist's Companion. Many bits of diverse information have been compiled into a single reference source. Do you need to look up a frequently used constant or equation? It's in here. Do you need to know the physical properties of Mercury's atmosphere? It's in here. Do you need the names, the dates, and the experiments on the spacecraft that have visited Venus? It's in here. Do you need to know what minerals have been found in meteorites, or maybe just the elemental abundances in the carbonaceous chondrites? That's in here too. In fact, there are a wealth of facts in this book.

Much of this information could be found by searching the reference stacks of the local library or even searching across the vastness of the Internet, but that could take hours or even days. All of the information contained in the tables is referenced to the actual research papers from which they were obtained.

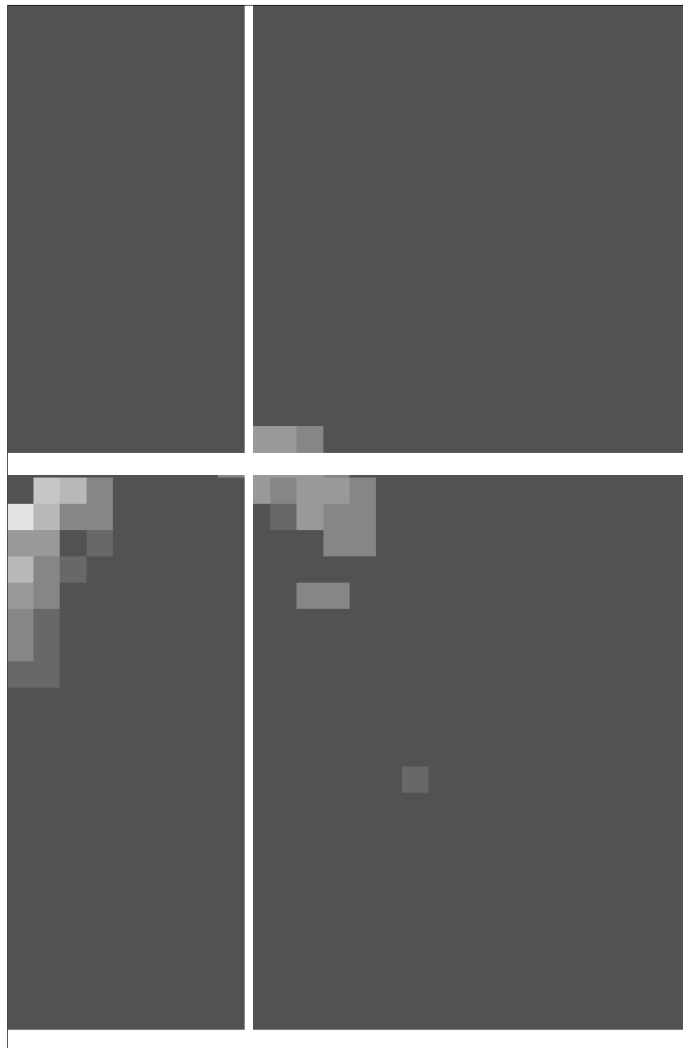
These source listings are a godsend when you're trying to track down a nearly impossible to find fact for a program. They also let you look up the original paper and read the details of the experiment or the research project that led to the results in the tables.

In short I would highly recommend that every planetarium acquire a copy of this book. Any planetarian who needs quick access to physical data that covers the planets, comets, meteors, stars, Kuiper belt objects, etc. should have a copy of this book in their library.

It is also a great source of trivia type information. Did you know the largest crater

on Mercury is Beethoven at 643 km? Did you know that the first attempt to send a spacecraft to Venus was Sputnik 7 launched on February 4, 1961, but it failed to depart Earth orbit. Did you know that the number of parent molecules identified in comets approximately doubled as a result of observations of Hale Bopp and Hyakutake? Molecules like HCN, NH<sub>3</sub>, CH<sub>3</sub>CN, SO, SO<sub>2</sub>, HC<sub>3</sub>N, and H<sub>2</sub>CS?

Oh and how about yikes I see it is almost time to present a program to the public. Oh well. Many more interesting facts will be here to find in the future when the next reporter calls.



Patrick McQuillen  
Reviewer  
Alexander Brest  
Planetarium  
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The Planetary Scientist's  
Companion  
Katherina Lodders  
and Bruce Fegley, Jr.  
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Inc.  
New York, New York

# News from SEPA States

George Fleenor  
Bishop Planetarium  
Bradenton, FL

## Bishop Planetarium, Bradenton

George Fleenor reports: We have been extremely busy with several projects. School groups are pounding down the door. I am sure this is typical of spring for most facilities. We are still looking for a Planetarium Assistant (Educator/Producer). I hope to fill the position ASAP. We are also looking to hire a full time technician. Due to recent restructuring in the museum and planetarium, the latter of these positions has not existed for the last two years. The search for employees was temporarily put on hold while Stephanie gave birth to our son. Skylor Thomas Fleenor was born on March 18, 1999. He weighed 7 lbs 6 oz and was 20 inches long. Mom and baby, in addition to our 2 year old daughter, Marissa Halley, are doing fine. Dad, however, is getting grayer by the minute. I am looking forward to the SEPA conference in June for several reasons.

Currently, we are running Sudekum's Worlds in Motion at 1 pm and 4 pm daily. We plan to run their new star show, Lunar Odyssey, at 1 pm followed by Worlds in Motion at 4 pm beginning July 1<sup>st</sup>. We have included a lot of laser work in our production of Worlds in Motion that adds a unique flavor to the show. For example: using laser to depict proper motion of stars is great! We plan to make this a commonly used effect in all of our future star shows, when possible. Our Saturday morning children's star show features Bear Tales and other Grizzly Stories in April. Lifestyles of the Stars will be featured in May followed by Loonies Moon in June.

Laser Swing was featured as the afternoon matinee laser show, January through April. This 35 minute laser show featured some of the classic Big Band era's Swing musicians, in addition to, more recent Swing Artists of pop culture. Cool Oldies 50s & 60s will be featured in May. For the summer months, June - August, we are planning another new show, Space Rock. Space Rock will feature music that has a space oriented theme. We thought it would be a great way to educate at the same time we are entertaining. Our Jimmy Buffett, Parrot Head Jam, show has been doing great in its nighttime spot. There appears

to be a lot of Parrot Head fans in Florida for some reason. We are also being courted heavily by a major country music station. So, it looks like we will be doing more country music shows as well. We are even considering a Disco Inferno Night with a local 70s station. This show might be complete with a John Travolta type performer on stage! Hey, it brings more people to the facility, is great publicity, and it helps pay the bills for all of the educational programs and needed equipment (toys)! The things we do for survival.

The planetarium, as reported in the last issue of Southern Skies, has been involved with a major light pollution battle. The good news is that we made a compromise with the City of Bradenton, and we have regained some of our dark skies. Watch for an extended article later in Southern Skies, possibly The Planetarian and a paper delivered on the subject at this year's SEPA conference in Jacksonville. The whole ordeal drew lots of publicity at National and International levels all of which was great for us and public education of Light Pollution issues. In short... we won! (Shhhhh) Now, to work on that Lighting Ordinance proposal... .

The observatory is enjoying all the publicity from the light problem. Visitation numbers are very high. We have noticed that the news helped generate a lot of traffic for the whole facility. Remember that publicity comes in many shapes, some of which can be very good for your facility. We will be enjoying the recent opposition of Mars, in addition to some bright deep sky objects, during our current public sessions. Our computer link, using The Sky software, should be completed sometime in early May. This will allow the computer to follow the telescope around the sky and be used as a locating device for faint objects. Find us on the Internet at <[www.sfmnp.org](http://www.sfmnp.org)>.

## Buehler Planetarium, Davie

Dave Menke reports: On February 25, Associate Director Susan J. Barnett was temporarily re-assigned to be House Manager of Bailey Hall (our College's 1500 seat cultural theatre). Susan has amateur

background in theatre, and has been at the College 11 years. She is also well liked. Susan will probably return to the Buehler Planetarium before SEPA in Jacksonville (We hope!). In her stead, our Assistant Director for Education, Ms. J.C. Moritz, has become Acting Associate Director. Emil Buehler Intern Marc Rouleau has become Acting Assistant Director for Education. We have had to cut back on a few things, but we are getting along okay.

March's show is Cosmic Catastrophes while in April it is The Mars Show. Each month we run a different public show. We have about 60 in our library of shows. In May, it will be Cowboy Astronomer. The children's show is In My Back Yard, through May.

In our smaller planetarium dome we are running What Time Is It? This is a 10 minute free show and gallery display. It will run through June.

We are busy with planning for the 13th Triennial International Planetarium Directors Congress conference, here, in early November.

Finally, our plans for the new Emil Buehler Observatory are moving along. We hope for a ground breaking this fall.

#### Hallstrom Planetarium, Ft. Pierce

Jon Bell reports: I am very busy with lots of college classes, lots of school shows, and lots of public programs. Calendar year 1999 began with The Voyager Encounters, which worked well with telescopic views of Jupiter and Saturn following the evening performances; and we will continue the Patrick Stewart narrating tradition with another Loch Ness production, The Mars Show. (Seems like I did that show a couple of years ago... 88?)

I am looking forward to another terrific SEPA conference, and to conducting another Constellation Shootout at the Alexander Brest Planetarium in Jacksonville. I won't stop until everybody in SEPA has successfully pointed out the dinkiest, most obscure constellations in the sky, and managed to win himself or herself a laser pointer from ILDA!

I'm working with Pat McQuillan, Director of the Brest Planetarium, to present an original production geared for school kids, grades 2-4, at the conference. The show is A Trip Through Space, and it is designed to fulfill all of the astronomy curriculum requirements for these grades. The show is 25 minutes long. This allows

the planetarium instructor about 10 minutes or so for questions at the end before the next group comes in (assuming a one hour turnaround time on programs.) The soundtrack, annotated script, and a teacher's guide will be available for purchase at the conference for a modest fee. There won't be any slides in this show kit, as the visuals are all things that surely every planetarium has - the Orion Nebula, the Andromeda Galaxy, the Pleiades star cluster, constellation outlines, and planet images, etc.

As if that isn't enough, I'm also collaborating with Erich Landstrom, Director of the Aldrin Planetarium in West Palm Beach, to create a show that explores the science of Star Trek, due for release in early 2000.

Hey, I need more things to keep me busy! How about getting accepted into a doctoral program at University of Central Florida. Let's see, it's been about 20 years since I earned my master's degree, yep, guess it's about time.

Say, did I mention that my wife Lisa and I have two wonderful boys, Danny, 3 $\frac{1}{5}$ , and William, 18 months? What more could you want?

#### Museum of Arts and Sciences Planetarium Daytona Beach

Roger Hoefler, Curator of Astronomy reports: the Museum of Arts and Sciences Planetarium in Daytona Beach continues operating as an adjunct classroom within the Volusia County District. During the past year, a satellite receiver and a C/KU band antenna system was added to the video display system. We now utilize video from LD, S VHS, NASA Select TV and Internet downloads directly into the theater.

During the fall season our public feature was Adler's program In Search of New Worlds. As new evidence of extrasolar planets was released from various sources, we added the photographs to the show during the live evening sky portion of our show. The current public show is the Loch Ness updated Light Years from Andromeda.

#### Alexander Brest Planetarium, Jacksonville

Patrick McQuillen reports: The staff of the Alexander Brest Planetarium is looking forward to June 27 - the day after the SEPA 1999 conference - so we can go on

George Fleenor  
Bishop Planetarium  
Bradenton, FL

vacation! But seriously, plans are well underway for what will, we hope, be a very memorable conference. The dates once again are June 22 - 26, 1999. The registration fee is \$140 per person. The conference hotel is the Jacksonville Omni Hotel. If you still need a registration packet, give us a call at 904 396 7062, ext 253, and we will rush one out to you.

Highlights of the conference will include a special up close and personal tour of the Kennedy Space Center and banquet guest speaker Dr. Norm Thagard. Don't miss SEPA 1999!

In the realm of programs, we are currently running Just Imagine as our public program. Just Imagine is a production of Nashville's Sudekum Planetarium. Of course, we are also offering Spring Skies, our live tour of the current night sky program on weekends.

School programs are in full swing, and plans are in the works for summer camps. We are offering a new Astronomy Camp this summer, which includes a trip to Kennedy Space Center. Also we are continuing, and expanding the number of weeks, of our popular Challenger Learning Center Space Camp. Busy, busy, and busy!

As you are reading this, we will be hip deep in programming, installing, debugging, and testing the half dozen or so programs that we will be showing at the conference and running as public programs this summer. Can you say a year's worth of planetarium show installation in one month? I knew you could. Now get down here and help. Anyway, we hope to see each and every one of you at the SEPA conference this June.

#### The South Florida Science Museum West Palm Beach

Erich Landstrom reports: The South Florida Science Museum explores that which is Not Of This World during the summer of 1999. The impetus for this exhibit is commemorating the 30<sup>th</sup> anniversary of the Apollo XI mission when astronaut Buzz Aldrin and some other guy walked on the Moon for the first time in human history on July 20, 1969. Taking inspiration from other successful NASA space missions to the Moon, the journey will then extend that vision into the 21<sup>st</sup> century and to other places. These places include the robotic reconnaissance of Mars and the feasible future exploration of the outer gas giants, their moons, and meteoroids in the Solar

System.

Planned for exhibition is a mixture of hands on, static and biological artifacts:

- Meteorites from Canyon Diablo and Mars
- NASA loans of a lunar sample collected during Apollo missions, an Apollo era EMU space suit, and scale models including a 40 foot Saturn V rocket booster, an 8 foot Eagle lunar module, and a 7 foot Columbia command module.
- A full scale model of the Athena rover schedule for launch in 2003, under construction at Cornell University
- A museum built Mars yard based on actual Pathfinder photographs for a virtual tour; photographs from the Apollo space missions, the Voyager I and II space probes, and the Hubble Space Telescope, showing the best possible images of other worlds in the Solar System
- Interactive and hands on exhibits including Space Gloves, Extraterrestrial Weigh In, and a 3 D factfinding Tour of the Solar System
- Several dozen exotic aquatic creatures which look very unearthly in the final portion of the exhibit with alien life, purchased by our aquarium curator in order to show the extreme conditions under which life may thrive.

NOTW works on several levels, modes, and themes:

- A. 1969: Moon Exploration by man; near earth distances; always sterile; static exhibits
- B. 1999: Mars and meteorites; exploration by robot; interplanetary distance; life now extinct; hands on exhibits
- C. 2039: Jupiter and giant planets; exploration by alien; interstellar distances; alien life may exist; biological exhibits

The Buzz Aldrin Planetarium celebrates the 30<sup>th</sup> anniversary of our namesake's exploring the lunar surface with a revival of Hansen Planetarium's Footsteps. Other aspects of the NOTW exhibit will be complimented by several Loch Ness Production shows: All Systems Go!, Larry Cat In Space, The Mars Show, and The Voyager Encounters. We also working on bringing back an older in house show called

### Mark Smith Planetarium, Macon

Jim Greenhouse and Carole Helper at the Mark Smith Planetarium in Macon will celebrate Astronomy Day on May 22. This summer they will be running two mini shows from Strasensburgh that have been spliced together: The Universe Game and Backseat Astronomy. The MSP is also renting a laser from ECCS for laser shows. The series of performances, which will be called Laser Days of Summer, starts June 4 with Laser Jam 99. And we'll have fun, fun, fun, till we have to send the laser away!

### Wetherbee Planetarium, Albany

Lisa Lofton wrote a dinosaur planetarium show which premiered April 1. They have an exhibit of Dinamation dinosaurs. The Thronateeska Heritage Center hosted Valentines by Moonlight on Valentine's Day. Couples participated in dinner and wine tasting. Afterwards, Lisa presented Romance and the Moon in the planetarium. The program was about myths and mythology related to the Moon and romance and included parts of a few romantic songs that related to the Moon. The applause was so enthusiastic that Lisa looks forward to doing it again next year. Audience members told her the center should have charged more than \$15 for the event.

### Oatland Island Nature Center Savannah

Max McKelvey reports that the Oatland Island Nature Center was closed temporarily to clean up some chemical contamination. They should reopen in June.

In the meantime, animal and Starlab programs are being conducted off site. There has been some talk about building a planetarium at Skidaway State Park so that there will once again be a permanent planetarium in the Savannah area. It is hoped that the needed money will be approved during next year's public funding cycle.

### Coca Cola Space Science Center Columbus

Tony Butterfield at the Coca Cola Space Science Center has added two new Digistar programmers to his staff. One is a student from Mali, Africa, and the other just graduated from the Savannah School of Art and Design. The CCSSC opened a dual city production with Hansen Planetarium.

This Hubble Telescope show was produced over the Internet using a Web server as an exchanging place for the OmniScan Laser, Digistar 2, and Digital Video files. The show opened in Columbus and Salt Lake City on February 24.

Tony is currently working on a show about extraterrestrial life called Encounters. Tony's 18 month old son brought production to a halt temporarily a few weeks ago when he accidentally flushed his dad's glasses down the toilet. Was it some kind of black hole experiment?

### Fernbank Science Center, Atlanta

April Whitt at the Fernbank Science Center is running two programs about the solar system this spring. The New Solar System describes current and future exploratory missions to the outer solar system for 4<sup>th</sup> and 5<sup>th</sup> grade school groups and for the general public. Planet Patrol (not the Sudekum show, but one they produced) is offered to family public audiences and kindergarten - third grade groups.

Monday April 26<sup>th</sup> was the kickoff for Fernbank's new NASA sponsored SEEMA lab, a teaching space in the exhibit hall that allows students to explore science and math with computers. Politicians and NASA personnel visited the center for the event.

The Fernbank Observatory is receiving upgraded hardware and software to tie them into the Telescopes in Education (TIE) network that Gil Clark runs at Mount Wilson in California. They're looking forward to participating in that program.

Dave Dundee and April Whitt taught distance learning classes about sunspots and life on other planets during the spring. The Star Station One™ program is gearing up as well, with Dave set to present a paper about it at the SEPA conference in June.

### GSU Planetarium, Statesboro

Becky Lowder is helping the GSU Planetarium and Statesboro Astronomy Club plan Astronomy Day at the Statesboro Mall on May 15 all day. There will be solar observing outside, Starlab shows every hour or half hour if needed, and lots of astronomy handouts and fun activities for everyone.

News from SEPA States  
continued

Jim Greenhouse  
and Carole Helper  
Mark Smith Planetarium  
Macon

Michael Sandras  
Freeport-McMoran  
Planetarium

### Freeport McMoran Planetarium and Observatory, Kenner

For this spring, the planetarium is to begin showing two new in house productions one on the Solar System and the other on the Space Station. These shows will be opening in conjunction with our Space Station exhibit that will be finally opening on May 6. This date coincides with National Space Day and we will be working very closely with Lockheed Martin on bringing many different displays and exhibit to the public.

We are also getting ready to work with the University of New Orleans and its annual camp known as Space Quest. Year after year this has proven to be an incredibly successful program in which many different aspects of aerospace education is taught to children from ages 10 - 14. Also, we have just taken our Young Astronauts to Washington, DC for a visit to the National Air and Space Museum and to other exhibits in and around the area.

We have just completed renovation of the observatory. While nothing was done to the telescope, some badly needed repairs to the building were completed.

### Louisiana Nature and Science Center Planetarium, New Orleans

Mark Trotter and Dennis Cowles are currently running The Sky Tonight, The Family Laser Show, and Cosmos. On Friday and Saturday nights they run laser shows including Pink Floyd's The Wall, Led Zeppelin, The Best of Pink Floyd, Rush 2112, Metallica, Pink Floyd's The Dark Side of the Moon, The Alternative Laser Show, and Laser Thrash. For school groups, they are offering The Little Star that Could, Planet Patrol: A Solar System StakeOut, and a live program on the seasons. They continue to offer monthly Science Insight programs on the first Saturday of each month. Recent topics have included lasers, Easter and the calendar, the search for life in the solar system, and a program on the seasons.

Mark has been busy playing with the new Barcodata 708 video projector. Bowen Productions Craig Back spent a couple of days in New Orleans installing the new projector and training the staff on how to use it. Mark hasn't stopped tinkering with it since he left. He is still figuring out new ways to integrate it into existing shows.

Dennis is planning to be in Paris for the eclipse in August. He has already booked

the least expensive hotel room in the city less than \$25 per night. The hotel is on Ile de la Cité in the middle of the Seine in the heart of Paris and only two blocks from Notre Dame Cathedral.

They are busy making preparations for Space Day in July to celebrate the 30<sup>th</sup> anniversary of the Apollo 11 landing. They are working on special programs, lining up exhibits and speakers, asking for donations for giveaway materials for the public, etc.

Mark and Dennis attended the New Views of the Moon workshop at the Lunar and Planetary Institute in Houston last year and are debating going to the second lunar initiative workshop in Flagstaff in September. If you are interested in attending this workshop (and learning about the cutting edge in lunar research), visit <<http://cass.jsc.nasa.gov/lpi.html>>, and click on Workshops and Conferences.

Finally, Dennis is continuing to work on his planetary geology workshop for the conference in Jacksonville. He is trying to come up with a way to top the electric pickle. Although he isn't giving away too much about this workshop, but he does admit to Alka Seltzer and Play Doh.

### St. Charles Parish Library Planetarium, Luling

Here at the Saint Charles Parish Library and Planetarium, spring is in full swing. We are bracing ourselves for that last minute May onslaught of class visits. Programs for this season include Spring Skies (guess what that's about), Skywatchers of Ancient Mexico (an old favorite), and Galaxies (lots of pretty pictures). New here at the planetarium is a new sign for our entrance. That doesn't seem like much for some, but for someone who has had the word planetarium in vinyl letters stuck on the entrance door, it is a much needed improvement. Our new director approved a larger display with a graphic of the projector, planets, stars, and such to be placed on the window just above the entrance. Now if I can only get that marquee crawler display.

### Lafayette Natural History Museum Planetarium, Lafayette

It has been a busy time in Lafayette. Public programs have included Moons of the Solar System, a live presentation based on the one from Lawrence Hall of Science, and Worlds in Motion from the Sudekum



Planetarium in Nashville. Staff members judged three contests in the regional Science Olympiad. The post Christmas Using a Telescope workshop was well attended this year, and plans are being made for solar observing and a star party for Astronomy Day in April.

Progress continues on plans for moving to another building with the completion of conceptual drawings and initial work on construction drawings. Bid requests will go out in the near future for the new

dome and control system. Current plans call for the planetarium to close down in very early 2000 for the refurbishing of the star machine and preparations for moving, with a grand opening in early 2001. Plans are beginning for limited public outreach programming in the interim.

Last year's planetarium attendance for public and school programming was about 18,000, by far the best mark since the planetarium reopened after being closed from 1992-95.

News from SEPA States  
continued

Michael Sandras  
Freeport-McMoran  
Planetarium

#### Sharpe Planetarium, Memphis

This spring the Sharpe Planetarium has been through a major three part renovation. Stage I was the rebuilding of the Minolta Series IV star projector which will provide clear skies for at least another 10 years from this venerable machine. Stage II included new carpet and seats with an epicentric rather than concentric seating arrangement. Although it actually lowered the number of seats in the theater from 165 to 130 the new arrangement provides for more comfortable viewing and wheelchair access. Stage III included a new 12,000 watt digital sound system from Bowen Productions; a new Barco video projector; a new ECCS control system for the theater's 56 slide projectors and multitudes of special effects, and a new laser system with Lasershow Designer software.

Also as part of the new renovation the theater received a new Planetarium Manager, Todd K. Slisher, formerly from the Gibbes Planetarium in Columbia, SC. Kathey Nix, the previous manager has been promoted to Theaters Manager over the IMAX, Mansion, and Planetarium Theaters. All the new systems (including the manager) are up and running, although a few last glitches remain to be ironed out of the system. New feature shows for spring/summer include Greatest Places in the Universe and Under a Moroccan Moon both of which are in house productions. Joining them is the Sudekum program, Planet Patrol in the Saturday children's time slot.

One final bit of renovation news is the departure of Planetarium Producer/Laserist Anthony Hale. Although he will be sorely missed, we would like to congratulate him because he is leaving us to become the new IMAX Chief Projectionist and Laserist at the Huntsville Space and Rocket Center in Alabama. We all wish

Anthony well in his endeavors.

#### Bays Mountain Planetarium, Kingsport

This spring Bays Mountain offers a new in house production entitled Spring Forward. Adam Thanz's script, covers the measurement of time, development of the calendar, where the days of the week come from, etc. The show is based on a live fourth grade presentation Bays Mountain has used as a school program for decades. In this new production, the whole story is related by Father Time, and the material was beefed up for a public audience. With all the excitement over the coming millennium, they figured this was a good topic.

The staff presented weekly StarWatches in March and April. The Bays Mountain Astronomy Club provided additional help. Club members and staff eagerly await a new 8 inch refractor. If all goes well the telescope will be in operation before summer.

Mike is currently working on the script for a Moon show that will incorporate the 30<sup>th</sup> anniversary of Apollo 11. One big difference between this presentation and earlier Moon programs they have done is that this version will be geared for second and third grade students.

#### CyberSphere Theater, The Renaissance Center, Dickson

The Renaissance Center is a nonprofit community learning center developed by the Jackson Foundation in Dickson. The

Todd Slisher  
Sharpe Planetarium  
Memphis, TN

THE DEADLINE FOR THE NEXT ISSUE OF SOUTHERN SKIES IS JULY 1. SEND SUBMISSIONS ON A 3.5 DISK OR VIA EMAIL ATTACHED FILE TO STARMANTNG@AOL.COM NOT TO TEAGUED1@TEN.NASH.TEN.K12.

Renaissance Center is home to a large performing arts hall, television production studios, art and music classrooms, professional animation instruction, and the CyberSphere 60 planetarium. Opening in August of 1999, the Renaissance Center is poised to make a dramatic impact on the Dickson community and the entire state. The Renaissance Center will be the hub of the Tennessee Virtual University, a collaboration between state and local governments, the Tennessee Board of Regents, and the University of Tennessee.

The CyberSphere theater seats 140 under a 60 Astro Tec dome. The CyberSphere is equipped with a Digistar II planetarium instrument, Omniscan laser graphics, Sky Skan enhanced interactivity, along with a complement of traditional slide and video projectors. For more information on the Renaissance Center and its programs, visit our website at <[www.rcenter.org](http://www.rcenter.org)>.

#### Heritage Planetarium, Maryville

The Heritage Planetarium, located at the base of the Smoky Mountains in Maryville, Tennessee, reopened its doors on November 2, 1998 after being closed for over ten years. During the summer of 1998, the facility was renovated with automated controls from East Coast Control Systems, and the refurbished Minolta Star Projector was back in business. In August the Blount County Board of Education hired University of Tennessee Physics student Thomas Webber to be the new director of the facility. The Planetarium is open to the public two Saturdays a month, and private visits can be scheduled anytime. Approximately 3,000 individuals have visited the planetarium, which also has a 14 inch Cassegrain telescope.

Currently, the Planetarium runs different programs based on the ages of the visitors. Orion's Story is intended for kindergarten students and is a live presentation re-enacting the mythology of Orion. Sun Fun is for first-third grade students and addresses the motion of the Sun in the sky and the rotation of the Earth. Zippy's Great Solar System Adventure is for fourth grade and above. It follows a light particle through the solar system and looks at the planets. Starlight Nights was recently added to our library, thanks to the generosity and patience of Mike Chesman and Adam Thanz of the Bays Mountain Planetarium, both of whom have been instrumental in helping to get Heritage started. Survey of

the Planets is for local colleges and offers a more detailed look at the planets. The Planetarium also did The Christmas Star during the month of December. All shows include a survey of the current sky, and finish with an audio driven laser light show. There is no charge for admission into the Heritage Planetarium.

#### Sudekum Planetarium, Nashville

The Sudekum Planetarium in Nashville has been running In Search of New Worlds since February. This show, produced by the Adler Planetarium in Chicago, does a fine job explaining the search for extraterrestrial planets and has been well received by families and children.

There have been some staff changes since the last issue. Eleanor Williams, the amazing giggling technician, has left the Science Museum after eleven years to take a position with BellSouth. As of this writing, Michael Sullivan is in the process of moving from Philadelphia to Nashville and will start work in early May.

Meanwhile, Sharon Mendonsa, Planetarium Educator with us for seven and a half years, has moved out of the Planetarium to assume the position of Education Manager where she will be supervising curriculum development, camps, workshops, and more. She will continue to serve as the IPS Portable contact for SEPA and will still be preparing education guides and other materials for the Planetarium.

Fortunately, as Sharon was looking to stretch her legs, Janaruth Ford was hired by the Museum as a generic educator. She has a physics and math background which made her a candidate to fill our impending vacancy. Janaruth has taken to the Planetarium like a fish to water, jumping in with both feet and taking on hundreds of students in countless school shows. After only three months, she has mastered a variety of programs and equipment, except that the VCR still does not like her.

What have Waylena McCully and Kris McCall been doing all this time? Production on Lunar Odyssey was completed in the spring, later than hoped but delayed because of staff changes. The show will play in Nashville throughout the summer along with the ever popular Rusty Rocket's Last Blast. Copies of Lunar Odyssey have been shipped to a number of other facilities, including Jacksonville, Florida, where it will also be featured during the conference in June. Craigmont's Duncan Teague

# NewGrange: Ireland's Stonehenge

This article is coming to you from a person who has not had a dome over his head for more than six years (unless you count the thinning hairs that provide absolutely no protection from reflected sunlight). Incidentally, for those of you who know me and occasionally wonder how time passes, my daughter Diana is now in 9<sup>th</sup> grade with (God help us) her learner's permit. This article is about a trip my family took in the summer of 1997 that is etched in my mind permanently.

Ask the average planetarium person/ astronomy expert who is planning a trip to Europe what subject specific sites he or she plans to include on the trip. Probably Stonehenge will be high on the list because of its archeo astronomical significance. Hardly anyone mentions the single, oldest archeological site in the world with a relationship to the Sun.

Don't get me wrong. Stonehenge is awesome. Unfortunately, unless you have connections, you will see it from afar. As you probably know, it has been fenced off for some time now. Wouldn't it be nice if you could find a site that is hundreds of years older, that you can touch, and where you can go inside? Think green, my friends. Think Ireland.

A short driving distance north of Dublin on the Emerald Isle's eastern side is a huge burial mound called NewGrange. Dating of the rocks indicates that the site is older than 5,000 years.

Imagine a huge grass covered, dirt mound with an entrance and hallway that

extends some 40 feet inward. Imagine actually going inside with a tour guide. Picture in your mind massive stone slabs that form the wall and ceiling. Paint in your brain a picture of how, at the end of the hall, there are three rooms (in a cruciform design) believed to be the repository of the cremated ashes of the ancient people who built the structure. Pretend that you can see the room on the right, more elaborately carved, that might have been reserved for the ashes of nobility. Depict how your vision is drawn upward to see stones staggered to form a pyramid shaped air space with a cap stone sealing the top.

Imagine a roof box opening at the entrance with the hallway that is pointed generally toward the southeast. Pretend you can see the rising winter solstice Sun thousands of years ago streaming through the roof box opening and running down the chamber to illuminate the very back of the interior on a few days on either side of the beginning of winter. Pretend you were there 5,000+ years ago to see this event. Imagine the significance it must have had for these ancient people.

Come back to reality. Imagine spending a bunch of money in an elaborately designed preview area/ gift shop on books, post cards, and anything you can get your hands on, since the tour prohibits interior flash photography. Come to think of it, stop pretending. Make plans to go there and see this awesome structure for yourself. Find out on your own that age is just a state of mind. While you're at it,

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## Craigmont Planetarium, Memphis

Planetarium staff Duncan Teague, Lisa DuFur, and interns Alicia Cooper, Kismet Kerley, Zakiya Larry, and Elizabeth Spilman will be producing the study guide for Sudekum's Lunar Odyssey. Duncan and Lisa have produced study guides for several other productions from Nashville, and we have all enjoyed this collaboration.

We plan to show Lunar Odyssey to celebrate the Apollo 11 anniversary, and we may also acquire a new production about explorers from the Bishop Planetarium in

Honolulu. This new show will include some constellation identification to show how ancient explorers used their knowledge of the sky to navigate.

We continue to show Our Place in Space, The Secret of the Cardboard Rocket, Solar System Adventure, and Hubble: From Here to Eternity to groups ranging in age from pre-kindergarten to senior citizens.

The new satellite dishes have recently provided several electronic field trips. Duncan was a presenter at the Fourth Annual Memphis City Schools Technology Conference. His presentation was Putting

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News from SEPA States  
continued

Todd Slisher  
Sharpe Planetarium  
Memphis, TN

# HST's Greatest Hits of '96

Duncan Teague  
 DT Publishing  
 3308 Bluemont Drive  
 Memphis, TN 38134-8454

The Space Telescope Science Institute (STScI) provides slides of Hubble images to individuals within regional affiliates who arrange to duplicate and distribute them. At our '96 conference, I was designated to receive and coordinate STScI materials and make them available to SEPA members.

Below you'll find a brief description of all 40 images distributed in 1996. Numbers next to the descriptions are shortened versions of STScI press release numbers, e.g., 21a refers to PR 96 21a.

The entire set of 40 slides is \$50, including postage and handling. Send your check or purchase order to the address at left.

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| <p>01.a Hubble's deepest ever view of the universe, revealing 1,500+ extremely faint galaxies in various stages of their development</p> <p>01.b Sample galaxies from the same Hubble deep field</p> <p>02 The inner region of a warped dust disk around Beta Pictoris once hidden because of the star's glare</p> <p>03 An image of the Egg Nebula taken by WFPC2; it shows the emergence of mysterious searchlight beams from behind a dying star</p> <p>04 The first direct image of a star other than the Sun: Betelgeuse.</p> <p>05 In more detail than has ever been seen before, the process a star like the Sun goes through when it dies</p> <p>09.a In clear, detailed pictures the first ever images of Pluto's surface; four views</p> <p>09.b Pluto surface map</p> <p>10 Gravitational lens effect captures image of primeval galaxy</p> <p>11 Images of globular cluster Mayall II, consisting of 300,000 old stars, in orbit around the Andromeda galaxy</p> <p>13.a The Helix Nebula, NGC 7293 showing collision of gases near a dying star</p> <p>13.b Helix Nebula detail with cometary knots surrounding the dying star</p> <p>14 A view of Comet Hyakutake that focuses on the near nucleus region of the comet</p> <p>15 Three layers of Uranus's atmosphere</p> | <p>taken with infrared filters; both clear and hazy layers created by a mixture of gases</p> <p>16 Image taken of Saturn where its rings appear edge on because of the position of the Earth in Saturn's orbital plane</p> <p>17 A view of several star generations found in the central region of the Whirlpool Galaxy</p> <p>18.a A rare view of Saturn's rings seen just after the Sun had set below the ring plane</p> <p>18.b A series of 10 images of several small moons orbiting Saturn</p> <p>21.a NGC 1365, a barred spiral galaxy located in the Fornax cluster</p> <p>21.b NGC 4639, a spiral galaxy located in the Virgo cluster</p> <p>22.a The Crab Nebula and a detail of the pulsar in its center</p> <p>22.b Sequence of three images showing changes in the Crab Nebula pulsar</p> <p>23.a Huge, billowing pair of gas and dust clouds in Eta Carinae</p> <p>23.b Expansion of Eta Carinae debris</p> <p>25 Hubble's 100,000th exposure captures an image of a distant quasar</p> <p>27 A vast nebula, NGC 604, which is known for a great starbirth region</p> <p>29.a 18 gigantic star clusters which may be building blocks for a new galaxy</p> <p>29.b Blue sub galactic clumps which may be galaxies under construction</p> <p>30 Jupiter's moon Io passing above turbulent clouds</p> <p>31 Clusters of stars and a fishhook shaped cloud of gases found in NGC 2366, a giant star forming region</p> <p>32 Changes in Jupiter's auroral emissions</p> <p>33 Views of weather on opposite hemispheres of Neptune</p> <p>34 A Martian dust storm around the edge of the north polar cap</p> <p>35.a A survey of quasar host galaxies</p> <p>35.b A quasar caught in the act of colliding with its companion galaxy</p> <p>36.a Supersonic comet like objects in the Cartwheel Galaxy</p> <p>36.b Cartwheel Galaxy composite image</p> <p>36.c Cartwheel Galaxy illustration</p> |
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# HST's Greatest Hits of '97

The Space Telescope Science Institute (STScI) provides slides of Hubble images to individuals within regional affiliates who arrange to duplicate and distribute them. At our 96 conference, I was designated to receive and coordinate STSci materials and make them available to SEPA members.

Below you'll find a brief description of all 40 images distributed in 1997. Numbers next to the descriptions are shortened versions of STSci press release numbers, e.g., 09a refers to PR 97 09a.

The entire set of 39 slides is \$48.75, including postage and handling. Send a check or purchase order to the address

<p>01 Central supermassive black holes in galaxies NGC 3377, NGC 3379, and NGC 4486B:</p> <p>03 SN1987A Fireball: One tenth light year long dumbbell structure expanding at six million miles per hour in supernova 1987A</p> <p>08 Changes in the nucleus of Comet Hale Bopp as it moves closer to the sun beginning in September 1995</p> <p>09.a Transition from spring and summer in Mars's northern hemisphere; photo taken shortly before opposition</p> <p>09.b Three photos of Mars taken six hours apart with 90° difference between images; photos taken shortly before opposition</p> <p>11 The Egg nebula in which stars are born and die violently; photo shows jets of gas being blasted into space</p> <p>12 A supermassive black hole located in galaxy M84</p> <p>13 NICMOS captures region of the Orion nebula filled with action as a center for the birth of new stars</p> <p>14 Supernova 1987A: different colors represent different elements in the ring</p> <p>15.a A view of Mars's cloud cover</p> <p>15.b Seasonal changes in Mars's north polar ice cap</p> <p>15.c Four views of Mars rotated 90° between images during summer in Mars's northern hemisphere</p> <p>16 The Cone Nebula: six baby sun like</p>	<p>stars surround their mother</p> <p>17 A collision between two spiral galaxies in the heart of galaxy Arp 220</p> <p>18 Fireworks near a black hole in the core of Seyfert galaxy NGC 4151</p> <p>19 STIS reveals an invisible high speed collision around a supernova</p> <p>20 Hubble pinpoints the optical counterparts of a gamma ray burst in a distant galaxy</p> <p>21 Hubble captures a volcanic eruption plume from Jupiter's moon Io</p> <p>22 A gamma ray burst blazes from a titanic explosion in deep space</p> <p>23 Hubble's look at Mars shows a canyon dust storm, cloudy conditions for Pathfinder's landing in July 1997</p> <p>24.a Dissipation of a large dust storm on Mars</p> <p>24.b Hubble shows dust and water ice clouds exhibit substantial daily variations</p> <p>25 Powerful telescopes discover the largest galaxy in the universe</p> <p>26 Hubble separates components in the Mira binary star system</p> <p>27 Hubble reveals huge crater on the surface of the asteroid Vesta.</p> <p>28 Hubble finds a bare black hole pouring out light.</p> <p>29 Hubble shows blobs of gas formed by some nova outbursts.</p> <p>30 Hubble keeps track of a fading gamma ray burst.</p> <p>31 Mars at the beginning of autumn in the Martian northern hemisphere.</p> <p>32 Hubble sees a neutron star alone in space.</p> <p>33 Hubble identifies what might be the most luminous star known.</p> <p>34.a Hubble reveals stellar fireworks accompanying galaxy collisions.</p> <p>34.b Detailed images of colliding galaxies.</p> <p>35 Hubble shows images of a blue straggler star.</p> <p>36.a Hubble tracks clouds on Uranus.</p> <p>36.b Hubble spots northern hemispheric clouds on Uranus.</p> <p>37 Hubble shows infrared view of moon, ring, and clouds of Jupiter.</p> <p>38.a Hubble sees supersonic exhaust</p>
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# HST's Greatest Hits of '98

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The entire set of 40 slides is \$50.00, including postage and handling. Send a check or purchase order to the address at left.

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| <p>01 COBE's infrared view of the Universe: three maps of the full sky seen in infrared light</p> <p>02 Distant supernovae: light sources determine universe's expansion rate</p> <p>03 Beta Pictoris: disk indicates planets, possible brown dwarf companion</p> <p>04 Jupiter aurorae: a curtain of light extends several hundred miles beyond Jupiter's limb</p> <p>05 Saturn's aurorae: curtains of light extend 1,000 miles above cloud tops</p> <p>08 Supernova 1987A: a collision between the expanding blast wave and circumstellar ring</p> <p>10 Serendipitous asteroids: HST images show curved trails of asteroids</p> <p>11A Planetary nebula NGC 7027: a brief stage in the evolution of a medium mass star</p> <p>11B Cotton Candy Nebula and Silkworm Nebula: phases of stellar burnout</p> <p>12 Star birth in barred spiral galaxy NGC 1808 possibly due to interaction with NGC 1792</p> <p>14A Centaurus A: nearest active galaxy to Earth shows turbulent firestorm of starbirth</p> <p>14B Centaurus A: tilted disk of gas at galaxy's core surrounds suspected black hole</p> <p>15 Stingray Nebula: Henize 1357, the youngest known planetary nebula</p> <p>16 NGC 1818: globular cluster of over 20,000 stars in the Large Magellanic Cloud</p> <p>17A GRB 971214: gamma ray burst is most energetic event in the universe</p> <p>17B GRB 971214: gamma ray burst; comparison of Keck Telescope and HST views</p> <p>18 Saturn: details of the clouds and hazes in atmosphere of ringed planet</p> <p>19 Possible first extrasolar planet ever</p> | <p>20 Four of NASA's proposed designs for the Next Generation Space Telescope (NGST)</p> <p>21 Galaxy NGC 4314: bright ring of starbirth around the galaxy's core</p> <p>22 NGC7052: galaxy with 300 million solar mass black hole in its center</p> <p>25 N81 in the Small Magellanic Cloud: a celestial maternity ward</p> <p>26A Galaxy Cluster MS1054-03321: thousands of galaxies 8 billion light years from Earth</p> <p>26B Supernova 1996CL: a March 1996 exploding star in galaxy cluster MS1054-0321</p> <p>27 Distant galaxy clusters: left, in Virgo; upper right, in Andromeda; lower right, in Taurus</p> <p>28 NGC7742: a small Seyfert 2 active galaxy probably powered by a black hole in its core</p> <p>29 Saturn: pastel yellows, browns, and greys distinguish cloud differences</p> <p>30 Sagittarius Star Cloud: HST peers into the heart of the Milky Way</p> <p>31 NGC7635, the Bubble Nebula: an expanding shell of glowing gas surrounding a hot star</p> <p>32A Infrared views: left: faintest galaxies ever seen; right: objects 12 billion light years away</p> <p>32B Deep field galaxy: left: visible light areas of starbirth; right, infrared disk structure</p> <p>34 Neptune: a look at the eighth planet's stormy disposition</p> <p>35 Uranus, August 8, 1998: its four major rings and 10 of its 17 known satellites; false color</p> <p>36 NGC6210 planetary nebula described as looking like a turtle swallowing a sea shell</p> <p>37 Quasar PG1115+080 and gravitational lens effect:</p> <p>38 Nebula M1-67 around star WR124: gas ejected into space at 100,000 mph</p> <p>39 NGC3132: southern hemisphere's Eight Burst or Southern Ring Nebula</p> <p>41A HST deep field south: thousands of</p> |
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# JPL '98 Slides

NASA JPL has sent us the following slides for the Galileo Mission and others. Slides are \$1.25 each.

P 35036B	Launch of Galileo on STS 34 Atlantis	P 47935	Io Glowing in the Dark
P 35213	Deployment of Galileo and IUS	P 47961	Ganymede s Nippur Sulcus
P 37218	Venus Colorized Clouds	P 47970	Ganymede Color Global
P 37327	Moon: Western Hemisphere	P 47971	Io in front of Jupiter
P 37539	Infrared Image of Low Clouds on Venus	P 47972	Changing Volcanoes on Io
P 37593	Earth: Ross Ice Shelf, Antarctica	P 48035	Stereo View of Ganymede s Galileo Region
P 37630	Global Images of Earth	P 48040	Natural and False Color Views of Europa
P 40449	Gaspra: Highest Resolution Mosaic	P 48063	Thunderheads on Jupiter
P 41383	Gaspra Approach Sequence	P 48112	Ganymede Uruk Sulcus High Resolution Mosaic Shown in Context
P 41432	Moon: North Pole	P 48113	Ganymede Galileo Regio High Resolution Mosaic Shown in Context
P 41474	Earth: Northeast Africa and the Arabian Peninsula	P 48114	Jupiter s Great Red Spot
P 41493	Earth: False Color Mosaic of the Andes	P 48122	Two views of Jupiter s Great Red Spot
P 41508	Earth: Moon Conjunction	P 48127	Ridges on Europa
P 42501A	South Polar Projection of Earth	P 48145	Io: Volcanically Active Regions
P 42964	Asteroid Ida: Five Frames Mosaic	P 48188	The Main of Ring of Jupiter
P 44130	Asteroid Ida: Limb at Closest Approach	P 48231	Callisto Crater Chain at High Resolution Shown in Context
P 44131	Ida and Dactyl: Enhanced Color	P 48236	Europa: Ice Floes
P 44297	High Resolution View of Dactyl	P 48293	Callisto: Scarp Mosaic
P 44520	Asteroid Ida Rotation Sequence	P 48294	False Color Mosaic of Jupiter s Belt Zone Boundary
P 44542	Comet Shoemaker Levy 9 Fragment W Impact on Jupiter	P 48299	Asgard Scarp Mosaic
P 47058	Ganymede: Comparison of Voyager and Galileo Resolution	P 48445	True Color Mosaic of Jupiter s Belt Zone Boundary
P 47065	Ganymede: Mixture of Terrains and Large Impact Crater in Unuk Sulcus Region	P 48496	Color Global Mosaic of Io
P 47162	Full Disk Views of Io (Natural and Enhanced Color)	P 48526	Europa Ice Rafts
P 47179	Three Views of Io	P 48527	Closeup of Europa s Surface
P 47182	Jupiter s Great Red Spot	P 48532	Mosaic of Europa s Ridges, Craters
P 47183	Dark Bands on Europa	P 48584	Io s Sodium Cloud
P 47194	Live volcano on Io	P 48698	E4 True and False Color Hot Spot Mosaic
P 47196	False Color Great Red Spot	P 48700	Jupiter Equatorial Region
P 47903	NIMS Ganymede Surface Map	P 48952	Jupiter s White Ovals, True and False Color
P 47905	Five Color Views of Io	P 48954	Ancient Impact Basin on Europa
P 47906	Europa In Color	P 48956	Active Volcanic Plumes On Io
		P 48439A	The Mars 98 Lander
		P 48440A	The Mars 98 Lander
		P 48494A	The Mars 98 Orbiter/Lander
		P 48495A	The Mars 98 Orbiter/Lander
		P 48567	Dr. Peter Tsou holds Aerogel
		P 48589	Stardust Spacecraft
		P 48691	Deep Space 1 Spacecraft

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# Impacts and Impact Process-

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Two primary geological forces affect terrestrial planetary bodies: basaltic volcanism (internal) and impact (external). Of the two, impact is more apparent because of the craters and basins it creates. The public has become more aware of the hazards due to impact recently with the multiple impacts of Comet Shoemaker Levy 9 into Jupiter in the summer of 1994, movies such as Deep Impact and Armageddon, and the widespread acceptance of the Impact Hypothesis for the extinction of dinosaurs.

Impact has played a major role in the evolution of terrestrial bodies in the solar system. The very formation of the solar system was an impact process, known as collisional accretion. The early history of the solar system was an era of heavy bombardment, the scars of which are easily visible on the Moon, Mercury, and the moons of the outer planets, and less visible on the surface of Mars.

## Energy Considerations

The energy released by an impact is enormous. The maximum amount of energy that can be released in an impact is given by:

$$E = \frac{1}{2}mv^2 \quad (1)$$

E is the energy in Joules  
 m is the mass of the impactor in kg  
 v is the impact velocity in m/s

The mass of the impacting body can be estimated by assuming a spherical impactor of constant density, leading to:

$$m = \left(\frac{4}{3}\right) \pi \rho r^3 \quad (2)$$

$\rho$  is the density of the impactor in  $\text{kg/m}^3$   
 r is the radius of the impactor in meters

If you wish, you may use the following equation to determine the mass of an ellipsoidal impactor with axes a, b, and c:

$$m = \left(\frac{4}{3}\right) \pi \rho abc \quad (2a)$$

In most cases the density of the impacting object will have to be an estimate. Table 2 may prove useful for such estimates.

These two equations can be combined into:

$$E = \left(\frac{2}{3}\right) \pi \rho r^3 v^2 \quad (3)$$

This equation tells us how much energy is released for a given impact, if we can make an estimate for the velocity of impact, the mass of the impactor, and the density of the impacting object.

The energy increases with the square of the velocity, but with the cube of the radius. In other words, increasing the velocity by a factor of 10 increases the energy by 100, but increasing the radius of the impactor by a factor of 10 increases the energy by 1000. This explains why the impact of a large comet or asteroid has globally devastating consequences, and the impact of even a moderately sized body can produce widespread devastation.

Below is a table of impact energies. The first object on the list is the asteroid 4581 Asclepius (1989 FC), which passed by the Earth on March 22, 1989 at a distance of some 700,000 km. I include this one because there was some media attention at the time. The second object is a potential future threat to the Earth Moon system: Comet Swift Tuttle, which passed Earth in 1992 and is scheduled to return in 2126. It has been estimated that there is a 75 percent chance that Swift Tuttle will impact either the Earth or the Moon within the next million years. The third object is the Chicxulub impactor, the trigger for the extinction of the dinosaurs. The fourth is Comet Shoemaker Levy 9 Fragment O.

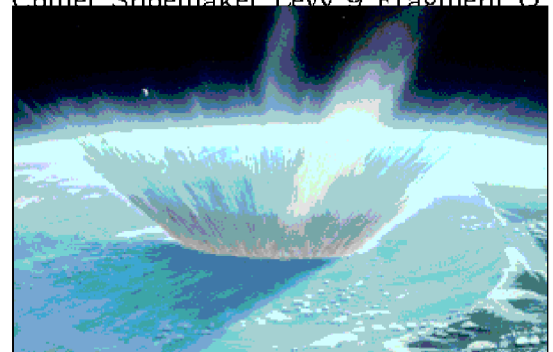


Illustration by William K. Hartman



**Table 1: Impact Energies**

Object Name	Radius (m)	Density (kg/m <sup>3</sup> )	Impact Velocity (m/sec)
Asclepius	100	3000	30,000
Comet Swift Tuttle	5000	1000	60,000
Chicxulub impactor	5000	3000	32,000
SL9 Fragment Q	2150	1000	60,000
Meteor Crater	12	7800	6,200

Object Name	Energy (Joules)	Energy (TNT Equivalent)
Asclepius	5.665 x 10 <sup>18</sup>	1.35 gigatons
Comet Swift Tuttle	9.42 x 10 <sup>23</sup>	225,000.00 gigatons
Chicxulub impactor	8.03 x 10 <sup>23</sup>	191,793.00 gigatons
SL9 Fragment Q	7.5 x 10 <sup>22</sup>	18,000.00 gigatons
Meteor Crater	1.09 x 10 <sup>15</sup>	260.00 kilotons

**Table 2: Densities of Common Planet Forming Materials**

Material	Density (x 10 <sup>3</sup> kg/m <sup>3</sup> )
Water (ice)	0.94
Water (liquid)	1.00
Carbonaceous chondrite meteorite	2.50
Plagioclase	2.70
Ordinary rock (average)	3.00
Pyroxene	3.30
Olivine	3.30
Ordinary chondrite meteorite	3.50
Iron sulfide	4.80
Iron	7.90

Taken from Consolmagno and Schaeffer 71.

**How Big is Big?**

A very common question is How big was the object that made that crater? This is not an easy question to answer, because of a number of different factors that come into play during crater formation. I have included an equation to estimate the size of crater that will be made, but it is not terribly accurate (it is usually within a factor of two). It also looks rather messy, but it can be used to get a feel for the general size of a crater that will be made from an impactor of a given size into a given target material of a given density. (For Earth I use  $\rho_t = 2600 \text{ kg/m}^3$ , for the Moon, 2900

$\text{kg/m}^3$ ).

$$D = 1.8 \rho_p^{0.11} \rho_t^{-1/3} g^{0.22} L^{0.13} E^{0.22} (\sin \theta)^{1/3} \quad (4)$$

$\rho_p$  is the density of the impacting object ( $\rho$  in the above equations)

$\rho_t$  is the density of the target material in  $\text{kg/m}^3$

$g$  is the acceleration due to gravity at the surface in  $\text{m/sec}$  (Earth – 9.80)

$L$  is the diameter of the impacting object in meters (please note, this is a diameter, not a radius)

$E$  is the energy in Joules, from equation

3, above

$\theta$  is the angle of impact in degrees  
 An interesting measure of the power of an impact is to calculate the Richter scale equivalent of the energy release. See Table 3, below.

$$M = 0.67 \log_{10} E - 5.87 \quad (5)$$

M is the equivalent magnitude on the Richter scale

E is the energy, calculated from 3, above

Table 3: Richter scale equivalents

Object	M
Asclepius	6.69
Comet Swift Tuttle	10.19
Chicxulub	10.14
SL9 Fragment G	3.40
Meteor Crater	4.20

Impact Erosion

One outcome of a very large impact is known as impact erosion, which results in the loss of atmosphere due to hypervelocity expansion of a vapor plume from the impact; the impact literally blows off some of the atmosphere into space. There are two basic requirements for impact erosion to occur. The first is that the impactor must strike at a velocity high enough to form a vapor plume that will expand at a speed greater than the planet's escape velocity. The second is that the mass of the vapor plume exceeds the mass of atmosphere above the plane tangent to the impact. (i.e., everything from the horizon upward). A rough estimate of the mass of vapor created during an impact is given by

$$M_v = (0.4 v_i^2 M_p) \epsilon_v \quad (6)$$

$M_v$  is the mass of vapor

$v_i$  is the impact velocity

$M_p$  is the impactor mass

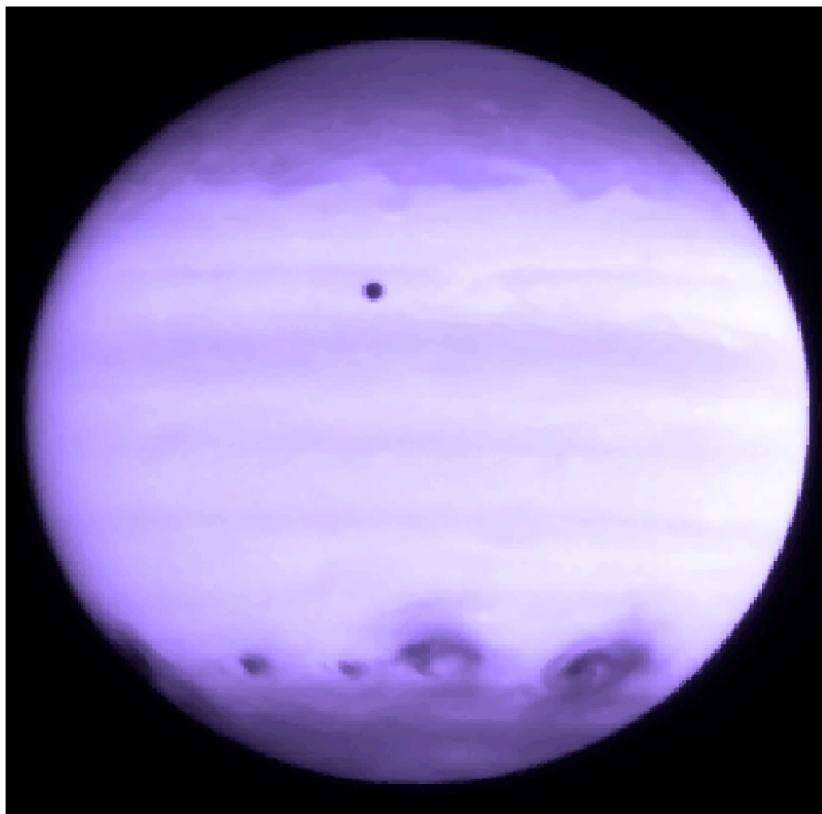
$\epsilon_v$  is the specific energy of vaporization of silicate rocks ( $5.7 \times 10^7$  J/kg)

The estimated minimum impactor mass for impact erosion is  $4 \times 10^{15}$  kg, and the estimated minimum velocity is 25,000 m/s.

Impact erosion probably played a significant role in the early history of planetary atmospheres. Repeated bombardment by large impactors would have certainly resulted in the loss of some atmosphere.

Impact Frustration

Another outcome of a large scale impact is to sterilize a planet. Any sufficiently large impactor will cause so much damage that conditions will be incompatible with life. It is possible that, at the very beginning of life on Earth, impacts sterilized the planet, and life had to start over. Impact frustration is defined as that time in Earth's history when the interval between devastating impacts was less than the minimum timescale needed to establish life. This



establishing timescale is estimated to be on the order of 100 million years.

#### General Impact Processes

We will examine the process of impact by reconstructing the events which took place during the Chicxulub impact 65 million years ago.

The impactor struck the Earth at a velocity of some 32,000 m/s. The impact vaporized the impactor and a lot of the target material as well. Hundreds of cubic kilometers of dust and water vapor were thrown out of the forming crater. As the crater formed, ejecta was thrown for hundreds of kilometers, thickest near the crater and thinning out further away.

Some of Earth's atmosphere was probably blown off during the impact, and some of the impact debris was probably blown into space (this may be the source of the microtektites which have been found). The expanding shock wave created tremendous tsunami which carried away loads of rock. These tsunami reached the nearest land masses, dumped their load of rock and continued inland for many kilometers before dying out. Winds created by the impact blew away from the impact point, reaching speeds of hundreds of kilometers per hour.

The energy released by the impact was probably sufficient to cause gases in the atmosphere to react chemically with one another, forming nitric and nitrous oxides. Combining with water, they formed nitric and nitrous acids, which rained out. The heat released by the impact triggered world wide forest fires. The smoke and ash generated by such fires remained suspended in the atmosphere for months, possibly years. Much sooty material has been found at the K/T boundary around the world. As many as half the world's forests may have burned.

The fireball rising from the impact point carried tremendous amounts of dust high into the stratosphere, where it could have remained for years before settling out. It is estimated that over 1400 cubic km (400 cubic miles) of dust was injected into the atmosphere during the impact. Much of this dust came from the target rock at the impact point, but some of it was from the impactor. The dust from the impactor is the source of the world wide iridium anomaly at the K/T boundary.

The crater excavated by this impact was 160 km (100 miles) wide and 8 km (5 miles) deep.

#### The Death of the Dinosaurs

The dust from Chicxulub was the culprit in the K/T mass extinction. The dust injected into the stratosphere was sufficient to prevent light from reaching the surface, for months or even years. Temperatures world wide probably dropped by tens of degrees. Plants around the world died. The phytoplankton in the oceans probably disappeared within 100 days or so. With the phytoplankton gone, along with all of the other plants, the ecosystem completely collapsed.

Over 75 percent of families of organisms disappeared as a result of this impact a major blow to terrestrial biodiversity. Other mass extinction events in Earth history may be impact related. The Permian extinction was more destructive some 90 percent of families disappeared.

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# It's in the Stars

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# It's in the Stars

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## ACROSS

2. The Eagle Nebula and the Orion Nebula are representatives of regions of star \_\_\_\_.
6. The brightest star in a constellation usually has this designation.
7. Postscript (abbreviation)
8. Washington College (abbreviation)
10. Abbreviation for radical group in Ireland
12. Abbreviation for the agency which the Nuclear Regulatory Commission replaced
13. Beta Aquilae
16. Stone from space
17. Environmental Protection Agency (abbreviation)
19. Constellation The Altar
21. Gamma Orionis
25. Beta Ursa Majoris
26. Beta Ursa Minoris (spelling variant)
29. \_\_\_ de Janeiro
30. Constellation between Virgo and Scorpius
32. Covered with fine carbon ash

## DOWN

1. American astronomer who studied the relationship between galaxies and quasars
2. Igneous rock
3. Postal Service abbreviation for Illinois
4. Symbol for thorium
5. Keck Telescope location
7. The Beehive
9. Belonging to the constellation which contains the nearest star to the Sun
11. 17th letter of the Greek alphabet
14. Ellie Arroway's research program in Sagan's book *Contact* (abbreviation)
15. Constellation The Ship
17. Tides \_\_\_ and flow
18. Gamma Andromedae
19. Whether prior or posterior, Beta Sagittarii
20. Chopping tool
22. French preposition
23. Radio Telescope in Puerto Rico
24. Teaching assistant (abbreviation)
27. Familiar winter sky constellation
28. Blood pipe
30. Learning support (abbreviation)
31. Irish exclamation of surprise

# SEPA Conference, June 22 - 26

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## Basic Information

A registration of \$140 per attendee (plus, SEPA dues) includes most meals, a dinner cruise on Wednesday evening, and a trip to Kennedy Space Center on Thursday. Return the registration packet mailed to you in March. If you did not receive a packet, call the Museum of Science and History at (904) 396 7062 ext 253, 234, or 242, and ask for a registration packet. Or go to SEPA's Website, download the forms, and mail them. SEPA's Web address is: <http://www.sepadomes.org/>

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## Kennedy Space Center Trip

Final plans have been worked out for the Kennedy Space Center (KSC) trip Thursday. We will leave the conference hotel at 7 am. KSC tour begins at 10 am with a tour of the Space Station Processing Building and exhibits. Then it is on to a guided tour in the Vehicle Assembly Building. (We may see a shuttle being processed.) Next, we head out to the launch pad. Space shuttle Columbia will be on the pad with the Chandra X ray Telescope in the cargo bay. The conference group photo will be taken here. We will then head over to tour the Saturn V exhibit. Lunch will be available for \$8.95 per person. This lunch is not included in the conference fees. We will have a special area roped off to eat near the Saturn V. Then it is back to the KSC Visitor's Center for free time. You can visit the large gift shop, the rocket garden, the robot exhibit, and the Mars exhibit. This trip is one that you will not want to miss.

In order to visit the Vehicle Assembly Building (VAB) you will need to wear long pants (no shorts, skirts or dresses) and flat, closed toe shoes. This is very important! NASA staff will not let you in the VAB if you are not appropriately dressed. The age restriction for the VAB is 12 years old. So don't be a child, wear long pants and sneakers, and bring a change of clothes with you for the rest of the trip.

## Workshops

Several additional workshops have been added to the list that is on the registration forms. If you would like to sign up for these just write them in on your form when you mail it back to us.

### Planets 101 An Introduction to Planetary Geology (Session 2)

Spacecraft have returned an unbelievable number of images of terrestrial planets in the last few decades, and such images have allowed planetary scientists to unravel the broad geologic history of the planets. What do those images reveal about planets and planetary processes?

### Space Music 101 Space Songs for Kids (Session 1)

Ever needed something fun to fill some time in a workshop or summer camp? How about a rousing round of musical revelry? Learn to sing several songs with space and astronomy themes. Such favorites as Twinkle, Twinkle, Little Star, A Shooting Star is Not a Star, and The Sun is a Mass of Incandescent Gas. Fun for all. Lyrics provided.

### Kodalith Workshop

This workshop will provide basic information about how to expose and develop high contrast, fine line Kodalith film. Necessary equipment is camera, copy stand and light source, 35mm roll film developing reels and chemicals.

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If you have any other questions please do not hesitate to call me or my staff. We hope to see everyone in Jacksonville in June and look forward to a very memorable conference. Contact Patrick McQuillan, Planetarium and Challenger Learning Center Director, Museum of Science and History, Jacksonville, Florida.

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# *Southern Skies*

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## In This Issue

President's Message.....	1
IPS Report.....	2
Editor's Message: (Amazing) Grace Period; SEPA Membership Form.....	3
Featured Planetarium: Alexander Brest Planetarium, Jacksonville, FL.....	4
Small Talk.....	6
Digital Cosmos: 3-D Tour of the Solar System.....	8
Book Review: The Planetary Scientist's Companion.....	10
News from SEPA States.....	12
NewGrange: Ireland's Stonehenge.....	19
HST's Greatest Hits of '96.....	20
HST's Greatest Hits of '97.....	21
HST's Greatest Hits of '98.....	22
JPL '98 Slides.....	23
Impacts and Impact Processes.....	24
It's in the Stars Crossword Puzzle.....	28
SEPA Conference Information.....	30

SEPA Conference, June 22 – 26  
Alexander Brest Planetarium  
Jacksonville, Florida

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