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On the Cover: Kappa Crucis Mobile Planetarium took the International Year of Astronomy to the entire country of Uruguay, visiting each of the capital cities. Daniel Scarpas conducts a planetarium session at one of the stops. Photos provided by Kappa Crucis; map outline from Wikipedia Commons. See story on Page 30.
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Please notify the Editor of any changes on these two pages.

Contact the Treasurer/ Membership Chair for individual member address changes and general circulation and billing questions.
**In Front of the Console**

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**Batter Up**

Don't you wish you could thump school board members a good one with the common sense stick? Don't you wish just one of your school board members would visit your planetarium to see for themselves a third grader's enthusiasm for learning? Not on a "cheese and wine reception for the board" visit, but during an actual class?

These words, of course, come as a result of recent news on Dome-L that two school planetariums were going to be closed at the end of this school year.

At press time, Arlington (Virginia) Public Schools planetarium appears to have been given a stay of execution, albeit with a much reduced budget, while the Colonial Planetarium in Plymouth Meeting, Pennsylvania, is still holding its breath.

In Arlington, the David M. Brown Planetarium, named for a graduate of Arlington’s Yorktown High School who was killed in the 2003 Columbia disaster, now will have only a part-time teaching position (down from 2 and a half).

The Colonial board had not made a decision by the time I write this, although it is listening, at least, to planetarium supporters.

Boards at both Arlington and Colonial argue that the cost of replacing outdated equipment is one of the reasons for their decisions. Arlington also questioned the educational value of the planetarium.

As a side note, the article that starts on Page 7, Assessing Planetarium Programs for Content and Pedagogy, refers to a study done for the Arlington planetarium.

Enthusiasm under the dome can translate to enthusiasm for learning in general. We know it intuitively, in our "hearts," if you will, but we can't quantify a feeling—or convince a school board that has already decided to close a planetarium and easily eliminate an entire line item on their budget that the money spent on and in the planetarium does more for education than it appears.

There's more about closing planetariums on Page 8, my brief wrap of the "state of the dome" now that the ripples of the global economic crisis are spreading insidiously.

---

**Enough Already**

Steve Tidey’s book review article in the December 2009 Planetarian continues to stir up the waters, the result of which are two additional Letters to the Editor (see Page 6). At this point we’re also saying “enough is enough” on the issue, which has become a political black hole (good data sucked in, politically-charged words spewed back out). Once an issue has been touched by politics (like abortion, religion, the economy, and even poor Pluto), it loses not its significance, but its ability to be discussed and acted upon with any sense of progress.

Also, on Page 7, is a statement by IPS President Martin George outlining the IPS stand— not on climate change, but on the necessity within science to have an open exchange of ideas. Just as we accept and print letters to the editor without changing their words, so do we accept material—in this case a book review, not a research paper—that might not reflect our views.

Just to remind you, on Page 3, bottom right hand corner, is a statement that we and most publications live by: “Opinions expressed by authors are personal opinions and are not necessarily the opinions of the International Planetarium Society, its officers, or agents. Acceptance of advertisements, announcements, or other material does not imply endorsement by the International Planetarium Society, its officers or agents. The Editor welcomes Letters to the Editor and items for consideration for publication.”

And there’s also the line “The Editor reserves the right to edit any manuscript to suit this publication’s needs.” I have never interpreted this line to mean that material will be considered or changed to fit a political line; it means that I’ll take a red pen to chatty, non-professional material as needed and to fix grammar, English, and typographical mistakes.

---

**More Evolution**

The Planetarian is ever evolving, seen most easily in our cadre of columnists. Chris Reed, who has been discussing the intricacies of the law under our domes for the past several years in his column General Counsel, has finally run out of topics for us and will submit articles on an “as needed” basis, perhaps once a year. I have always enjoyed reading Chris’ columns; it is a rare writer who can take something like copyright law and make it interesting to read. Thanks so much for sharing your expertise, Chris.

This also is the final Planetarium Show Reviews column from Steve Case, at least for the moment, who took on a controversial job and set the standards for it honestly and fairly. Starting this summer, Steve is taking a leave from Olivet Nazarene University to pursue graduate studies at Notre Dame in the history and philosophy of science. He’ll continue to work part-time at the planetarium, but doesn’t anticipate the time to continue the column.

Anita Sohus has done a superb job of putting together columns relevant to planetariums from the multi-tendrilled monster of information that is today’s NASA. As NASA does a better job of sharing information to the public, Anita’s job has become more difficult; just what do you pick? A quarterly publication just skims the surface. This is a case where internet resources are a better choice than print, so we urge you to take advantage of the wealth of information from the beat on line and wish you good luck with your navigating.

The always enthusiastic John Schroer has agreed to combine his What’s New Information with material that would have appeared in Gibbous Gazette in a new column that I’ve called Waxing Gibbous (because it’s getting bigger). It’s a nice blend, and it’s the place where we can share information about people and products.

Steve Tidey has been absent for the past two issues, not because he’s avoiding the storm of the climate change issue, but because of an illness close to the family. He’ll be back again in September.

---

**Here’s the correct address**

In Mike Shanahan’s March 2010 article about improving planetarium programming through formative evaluation, he gave the wrong internet address to check for evaluation data of his Galileo program. Here is the correct address to this evaluation data directly: www.bishopmuseum.org/planetarium/pdf/Galileo%20evaluations.xls. Here also is the correct link to the overall Bishop Museum Watumull Planetarium web site (Galileo evaluations are on right hand side part way down): www.bishopmuseum.org/planetarium/planetarium.html.
READY?...

www.globalimmersion.com/ready
Letters to the Editor

More input on The Chilling Stars review I

Dear Editor:

Steve Tidey’s review of The Chilling Stars by Henrik Svensmark and Nigel Calder makes the assumption that the cause of global warming is still being debated within the serious scientific community. It is not. Both Steve’s own Royal Society and the National Academy of Sciences in the United States have stated unequivocally that climate change is a result of human activity and the increased release of carbon dioxide into the atmosphere.

Such a conclusion from the world’s most respected scientists is not reached without serious and extensive study. These top-rung researchers are well aware that what they find will become the official position of the scientific community.

Planetariums are not in the same position. They are not expected to do research, weigh evidence and reach consensus. Their mandate is to teach science and inspire wonder. Implicit in that mandate is the assumption that the science they teach represents the best understanding of the subject at that time. For that they must turn to the best and the brightest—to institutions like the Royal Society and the National Academy of Sciences.

As the official publication of the international planetarium community, the Planetarian should reflect the best, most credible science available as well. Just as it encourages peer review of its articles, it should take similar care to avoid calling attention to a view of climate change that flies in the face of the greater scientific community.

Finally, Steve Tidey’s characterization of climate scientists as the “carbon lobby” is misleading in the extreme. Is he not aware that in the United States the term refers to the oil and gas industry?

I urge the Planetarian to take its responsibility seriously to offer the best information available on climate change from the most trusted sources. It speaks for our industry and should reflect its best practices and conscientious pursuit of the truth.

Jim Sweitzer, PhD
Science Communication Consultants, Oak Park, Illinois

More input on The Chilling Stars review II

Dear Editor:

It is amazing that people with scientific backgrounds can be brainwashed into believing something. I find quite frightening the responses from planetarians who have been brainwashed by people like Al Gore1 and the Intergovernmental Panel on Climate Change. So to the folks who said that Steve Tidey was wrong, I now offer you facts, since I spent 15 years as a broadcast meteorologist and have a background in climatology and climate studies.

There is no worldwide consensus that humans cause global warming, and actually no consensus that there is actually any global warming outside of the Earth’s normal cycle of warming and cooling. It depends upon where the data is taken. Are any of you aware that the GW alarmists get their data from weather stations at airports, toll booths on major highways, and large cities where the “heat island” effect distorts the overall data? Data has been compiled that shouldn’t be used, because its reporting points are located on hot black asphalt, next to trash burn barrels and even attached to hot chimneys, a methodology that is seriously flawed.

Are any of you aware of the 31,000 American scientists who can prove that there is no anthropogenic global warming? Are you aware of the fact that even the founder of the Weather Channel has called global warming a farce?

How about the fact that several NASA scientist have said that CO2 is not the main greenhouse gas, but water vapor is—and that comes from ocean evaporation. How many of you are aware that over 50 percent of the CO2 in the atmosphere is from plants and trees, as once they reach mature stage actually release CO2 into the atmosphere? Some 45 percent of the CO2 is from ocean evaporation, and only 3 percent is from human activity.

Are any of you aware of the fact that Al Gore’s 25 points in his movie2 can be disproven with simple college level earth science? Think of your earth science, people. Ice displaces the same amount of water that would be there if it melted. Therefore the alarmist scenario of melting polar caps flooding the continent is way off base. Meteorologists all over the country have admitted that the computer models used to support GW are flawed in the way they use the data.

How many of you are aware of the global cooling scare in the early 1970s? A scare that predicted famine, disease, and hundreds of thousands of deaths; all by the year 2000. Duh, wrong again!

I guess if you go against the trend of supporting global warming, you are maligned. The fact is, that regardless of what we hear from the media and from the IPCC, (which, by the way, has hardly any folks on their panel who have degrees in meteorology or climate studies), GW is not an established scientific fact. It is political agenda.

Lars Broman talks about his fellow scientists who believe in GW. He would be shocked to find out about the many members of the planetarium field who believe that this global warming stuff is a farce. They, however, will not openly write that for fear of being maligned.

Ka Chun Yu claims that the mindset that Steve Tidey has is not one that serves our planetarium audiences well. So I guess according to Ka Chun Yu, unless you buy into the GW scare, you are of the wrong mindset.

If you would like to read about all of the scientists who are against the global warming scam, you can go to my web site at www.look-to-the-skies.com and scroll down to the weather section. You can also see how Al Gore’s inconvenient truths are nothing but inconvenient misinformation, and read about all of the predicted warming and cooling scares in the past 100 years, of which none have actually happened. Read the facts, and don’t be led around like cattle going to slaughter!

Steven LJ Russo
Suits-Bueche Planetarium
Schenectady, New York

1 Referring to former U.S. Vice President Al Gore and his crusade against global warming. -ed.


PARTYcycles

Who are you?  Some say I am a particle…
Some say I am a probability cloud.

Some say I’m a wave…

...or a vibrating super-string.

Wow! Insecurity alert! I just wanted to know your name.

Alex Cherman

Planetarian  June 2010
The response from IPS

Dear Editor:

In response to the letters criticizing the decision to print the book review article by Steve Tidey, I make the following observations and comments on behalf of the IPS Officers and Publications Chair.

I am sympathetic to the basic scientific point of view laid out by Lars Broman and Jim Sweitzer, as I think it is correct. However, I am disappointed by the way they have chosen to argue their points of view: to me they read not as part of a scientific debate but rather as a polemic. A polemic is a dispute arguing a single point of view; a debate recognizes that there is always more than one point of view.

I do not agree that Steve Tidey's review article is out of line, or that the Planetarian should not be publishing his work. On the contrary, while I am unsympathetic to Steve's viewpoint, like many scientists and non-scientists, I think that everyone has a right to their point of view. It is a cornerstone of reasonable debate and of our democratic systems that we defend this right to free speech, even if we strongly disagree with the sentiments or think they are misguided or just plain wrong.

If material is misguided, it can be disputed by reasoned argument; if it is wrong, it can be corrected by reasoned argument.

Thus, the Planetarian's Editor has been charged to exercise her judgment to make our magazine interesting and informative. Far from making planetarium professionals look bad, or implying that by printing someone's opinion piece we are endorsing the viewpoint, it is the strength of a journal to print something thought provoking, even if you think it is left field or incorrect.

I think that the only instances where censorship ought to be considered is if the article is libelous, profoundly offensive, or promotes hatred or racism or any of the other disastrous aberrations that caused so many deaths in the century just past.

It is the job of the readers to decide where they stand. Any debate ought to be carefully considered, words weighed and measured, and should reflect the hallmark of a civilized democracy. Debate can be conducted through the medium of face-to-face discussion or through the letters column. I would much prefer that we receive some letters rather than none; at least a few of our readers are being stirred and we are promoting debate. It is also within our Editor's gift to curtail such debate and move on, as that is her job.

So translating this into a policy for our journal, I suggest: “In the Planetarian journal, all opinions are held freely, and the IPS community unreservedly supports this principle. It is not scientific to use anything other than reasoned argument to refute claims or to modify theories.”

Dr. Tom Mason
IPS President
Sharon Shanks  
**Planetarian Editor**

There have been some good news and some bad news in the planetarium field recently.

Among the good news is the reopening of the Flandreau Planetarium in Tucson, Arizona, closed last year due to a budget crisis in the state university system in Arizona, and the planned reopening of the Moscow Planetarium. See Waxing Gibbous on Page 73 for more information on both.

The bad news, of course, includes planetarium closures and the lay off of more respected people in the field. In this issue, the people affected are Noreen Grice from the Boston Museum of Science, after 26 years (see Page 73) and Tom Callen from Cosmonova in Stockholm, Sweden, after 18 years (see Page 55).

As I write this, it’s that time again: the end of the academic year for schools and the time when school boards struggle to finalize budgets for the following fiscal year. Unfortunately, one budget item that can be cut easily is the school planetarium.

Readers of Dome-L have been kept up to date on the threatened closing of two school planetariums in the eastern half of the United States, in Arlington, Virginia and Plymouth Meeting, Pennsylvania.

I was curious, however, about how many other planetariums were facing closure. I did a quick Google search and came across the following:

- The Dunn Planetarium at Danvers High School, Massachusetts, was set to close on May 14, to make way for school reconstruction. Moving the planetarium was not in renovation plans.
- The Independence High School Planetarium in San Jose, California, closed in 2008, again due to budget cuts.
- The Canberra Planetarium and Observatory in Downer, Australia, closed early this year. The owners of the site upon which it stands plan to develop the land.
- In the March issue of the *Planetarian*, the Astronomical Planetarium in Saint-Etienne, France, was fighting “repurposing” by the city government.
- I’m sure there are more, especially among the school planetariums. They are the most likely to close and traditionally have suffered the most at the wrong end of the budget. Why is this so? Here are my thoughts:
  - Many school planetariums were built in the glory days of space exploration in the 1960s. School administrators who supported them have long since retired and the current generation of administrators sees the planetarium as an expensive relic.
  - Planetariums are not part of mandated state or local government programs. They are expendable. Natatoriums can be justified as part of physical fitness programs; planetariums cannot say the same for educational programs.
  - The equipment in school planetariums isn’t as likely to be updated as in the university- and museum-based facilities, which can seek large grants and/or use in-house development offices to seek capital campaign funds.
  - Astronomy is disappearing from state education standards; most states that still mention it include it with earth science or senior level physics.

**We Need the Research**

One thing that can help a planetarium’s case is solid research showing the efficacy of the planetarium in education.

The problem? We’re such a divided field. The variety of skills and talents within our field is amazing, but there is a lack of true researchers who can investigate, write, and publish research papers out there, including by Dr. Larry Krumenaker, whose paper on “High School Planetariums: Results of a Survey” appears in the December 2008 *Planetarian*.

Another “must read” appears in *AER* Vol. 8, 2009, “Meta-analysis of Planetarium Efficacy Research” by Bruce Brazell at Navarro College in Corsicana, Texas and Sue Espinoza at Texas A&M in Commerce, Texas.

The major thing that jumps out at me is the age of the studies being analyzed: most are from the 1960s, 70s and 80s. Just a few are from this century.

I fully realize that on our own, working by ones or twos, we do not have the knowledge (or time) to develop an evaluation instrument to measure our effectiveness beyond the dome. Nor do we have the training in education research methods to evaluate the results and publish the results.

We need to collaborate.

We need an evaluation tool that can be shared and used by nearly all planetariums, regardless of their size or setting, that can collect solid data on the effectiveness of planetariums.

We need a central point where data can be submitted by individual planetariums, and then analyzed by a trained team.

This sounds like a grand, huge project, and I admit it is. But it is doable, perhaps with APS or perhaps with a National Science Foundation Grant.

Without this research and its published results, planetariums will continue to shut down and people will continue to be out of work. It’s a loss to us personally and professionally, of course, but more of a loss to the children who will never have the chance to be amazed by the stars and led down paths in science, engineering, technology and math.

Without this professional level of research and publication, planetariums will continue to be relics, placed in importance far behind college professors and school teachers when it comes to astronomy education.

☆
Assessing Planetarium Programs for Content and Pedagogy

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Abstract: We present an approach to the assessment of planetariums and planetarium programs. We not only address aspects of operations and maintenance of planetariums, but also the educational aspects of the planetarium programs, including content and pedagogical approach. We highlight the need for relevancy of planetariums and planetarium programs to state science education standards of learning (in Virginia known as SOLs) and the National Science Education Standards (NSES). We believe such planetarium assessments are necessary to allow planetariums and their programs to better serve their targeted audiences of students and the community within which they exist be it formal or informal science education venues.

Introduction

We were contacted by the science supervisor of a nearby county public school system to discuss the assessment of the planetarium which it supported. A contract proposal was bid and ultimately negotiated between the public school system and our institution. We report herein the approach used to perform the assessment. By proposal design and mutual agreement, this includes the relevancy of the planetarium and its programs to the educational goals of the county, which must align itself with state standards for science education, in our case the Science Standards of Learning for Virginia Public Schools (SOLs) (Virginia Department of Education, 2003), as well as the National Science Education Standards (NSES) (National Research Council, 1996).

The utility of planetarium programs in K-12 education has been studied extensively with respect to the astronomy education concepts which form the basis of science education standards (Adams and Slater, 2000; Bishop, 1996; Bishop, 1992; Brinkman and Nerdahl, 1982; Cavedon and Peri, 2004; Croft, 2008; Hostetter, 1988; Platco, 2005; Plummer, 2009; Ridky, 1974; Sarrazine, 2005; Skelton and Lombard, 2007; Smith, 1974; and Wyatt, 2002).

Unfortunately, it appears that implementation of research-based pedagogical reform has been lacking in educational planetarium programs (McComas, 2006). Examples of such research-based approaches include the 5-E Model of Instruction (BSCS, 1989), problem-based learning (Delisle, 1997), project-based learning (Krajcik and Czerniak, 2007), and integrated instruction (Ritz, 2007).

Furthermore, the utility of fulldome video presentations using modern digitally controlled projectors allow for the inclusion of science content and pedagogy in disciplines...
far beyond the standard applications to astronomy, but still well within the science education standards set at our state and national levels (VDOE, 2003; and VDOE, 2003b and NRC, 1996).

Planetariums and their programs can and should be used not only for astronomy education reform and public outreach, but also for other discipline outreach and education, including biology, chemistry, climatology, geology, meteorology, and physics. This may likely be the only way that planetariums can justify their existence in educational systems and informal education venues today, on a cost effective basis.

Methodology

We summarize the methodology used in this study herein. Our first task was to develop a proposal to support the assessment of the planetarium. The approach taken was based upon the museum assessment program of the American Association of Museums (AAM, 2010), augmented with education- and planetarium-specific applications. The proposal detailed the assessment in the following tasks:

Task 1 - Initial interview
Task 2 - Preparation for site visit
Task 3 - Develop agenda for site visit
Task 4 - Develop questionnaire for site visit
Task 5 - Site Visit
Task 6 - Analysis and synthesis of data
Task 7 - Draft report
Task 8 - Feedback from draft report
Task 9 - Final report production

After the initial contact with planetarium management, we received an overview of the planetarium facility and established goals for the primary assessment as well as a timetable for our planetarium visits. We also identified representatives of the county school system as points of contact.

As part of our review of project materials in preparation for facility site visits, we performed the following reviews:

- Planetarium program mission statement
- The school division’s long-range plans for the planetarium program
- SOLs and NSES related to planetarium goals
- The school division’s science curriculum especially as related to planetarium goals
- Curriculum materials used during instruction at planetarium

- Information about equipment in planetarium
- Information about the planetarium building and surrounding spaces
- The school division’s emergency preparedness plans
- Facility environmental data, including number of persons to be seated in the planetarium facility
- Surveys and other reports that the school division had conducted in the past related to the planetarium
- Staff positions and people who fill them

Following the reviews, we prepared an agenda and questionnaire for the primary site visit that, in addition to the areas listed above, also sought information about the planetarium’s equipment management policy; show-related policies, guidelines, and standard operating procedures; a history of the structure; written plans for facility expansion/rehabilitation, if any; and environmental monitoring. Not all of this information was available and some simply didn’t exist.

During our primary site visit, assessors viewed both live shows and recorded planetarium shows with students present. There were also follow-up site visits, during which time assessors observed additional live planetarium shows as well as “canned” planetarium shows geared for public viewing and informal science education.

Additionally (but not financially supported by the grant itself) we visited the manufacturing facilities of one of the top planetarium manufacturers, Spitz, Inc. (an E&S Company), headquartered in Chadds Ford, Pennsylvania. We were also able to meet with other planetarium projector and show producing companies while in attendance at the Middle Atlantic Planetarium Society Conference held in 2009 in Bowie, Maryland, where we also made a brief presentation regarding the assessment approach used in performance of our grant with the local school system.

The major points in the final report addressed:
- General Information
- Staffing
- General Building/Facilities
- Climate Control and Environment
- Planetarium Equipment Policies
- Exhibitions
- Storage
- Emergency Preparedness
- Education Review
- Recommendations and Conclusions

Discussion

We address here just a few of the most outstanding issues that we encountered in our performance of our planetarium assessment. We first note that the conduct of an assessment by a two-person team can only be accomplished if all of the necessary expertise for the assessment can be found in the backgrounds of the team members. For example, as in a museum assessment, one member of the team needs to have sufficient civil engineering background in order to address the appropriateness of the facilities and their management. In this case, the senior team member had civil engineering training with the U.S. Army Corps of Engineers at Fort Huachuca, Arizona. Thus, this two-person team encompassed the necessary experience within the three major thrusts of the assessment, namely, the facilities themselves, the operation and management of the planetarium projector and its ancillary equipment, and finally the education standards and their implementation.

Mission statements do not always meet the standard criteria for mission statements, such as those highlighted in 1998 by Janel Radtke in Strategic Communications for Nonprofit Organizations (Radtke, 1998). Standard criteria for a mission statement would limit it to a single paragraph which personnel could readily repeat; avoid jargon; explain the existence of the organization; and, describe what the organization hopes to achieve in the future.

Position descriptions are often nebulous and may not be available for the assessment study. However, all personnel should have the necessary capabilities to perform all of the tasks associated with the planetarium facility as needed, regardless of the position description details.

As an example, if a planetarium is run as part of a larger facility, there may be no building maintenance staff personnel dedicated to the planetarium. Building maintenance may be handled through the maintenance staff of the larger facility, but these may not be available during all scheduled show times. Maintenance personnel descriptions may simply not be available to planetarium assessors, as they are not attached to the planetarium facility. Nonetheless, assessors may wish to assist planetarium management in defining such ancillary positions to the planetarium facility.

There may not be any formal orientation provided in planetarium operations and maintenance. Personnel may be associated with the planetarium for many years. They may learn by means of on-the-job training with respect to operations and maintenance of the planetarium facilities.
No Budget for Development

Another issue with planetarium facilities is that there may be no budget allocated for updating the skills of any planetarium personnel. Professional development programs are all too often overlooked in both formal and informal science education venues.

Another issue for planetariums, particularly for those which are one smaller portion of a much larger facility, may be that there is no separate signage for the planetarium itself. The planetarium itself may then be almost invisible to both school system employees and the general public itself.

Finally, for educational assessment, we concluded that planetarium assessors need to focus on the science educational content, grade level appropriateness, and relevancies to science standards at both the state (SOLs for the authors’ state of Virginia) and national (NSSE) levels.

Conclusion

We conclude that formal planetarium assessments, similar to formal museum assessments, are necessary to justify the position of a planetarium and its programs within the formal science education community and the informal science education community. Only by addressing assessment issues, including the upgrade requirements of the planetarium facility itself, and by more closely aligning the planetarium to the particular educational science standards of learning and modern research-based pedagogy, can planetariums and their programs continue to be a valuable asset to formal and informal educators, as well as the public at large, within the confines of a cost-effective educational or public outreach system.

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(Continues on Page 25)
 methods for sharing audio among planetariums

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Abstract: Operations Manager Dan Neafus of Gates Planetarium at the Denver Museum of Nature & Science approached the Recording Arts department at the University of Colorado Denver about collaborating to explore solutions for sharing audio with other planetariums around the world so that audiences have similar immersive audio experiences, and audio engineers can easily create those experiences.

The research considers: acoustics, production, delivery, equipment, seating arrangements, current and future audio technology, and what similarities and differences exist between planetariums.

This article highlights a survey of over 100 planetariums worldwide, describing current audio methods and practices. This work supports the community’s movement towards audio standardization and dissemination of best practices for immersive audio production.

In our survey of planetariums around the world, two of the questions we posed were: “How immersive is your visual experience?” (Figure 1) and, “How immersive is the aural experience?” (Figure 2).

More than 100 people responded to our survey, and rated the aural experience as less immersive than the visual one.

But what about all those speakers? What about 5.1 “surround sound”? And why can’t a show that sounds fantastic in one theater sound just as great in another? It’s relatively easy to surround the audience with sound, but is the audio really enveloping? More to the point, is it an accurate representation of the audio engineer’s intent?

The audio experience of each planetarium differs widely from one venue to the next. In this article, we examine the challenges that prevent some planetariums from sharing—or merely achieving—great audio. In the Appendix, we summarize the results from our survey, presented at the 2008 IPS Fulldome Summit in Chicago.

Acoustics

The domed surface of the planetarium presents many challenges, not just speaker placement. Other factors include the surface of
the dome onto which the visuals are projected (acoustically transparent, perforated aluminum in most cases) and behind which the speakers are situated; the seating in the theater; the arrangement of the loudspeakers; and the type of construction material surrounding the dome itself.

In 2005, a study at Brigham Young University’s Summerhayes Planetarium concluded that BASWAphon® acoustic material can help control unwanted reflections from a dome and also is good for projecting images. They also found that directional loudspeakers improve speech clarity by keeping sound out of the dome [Shepherd].

Loudspeaker Correction

Loudspeaker correction is necessary in order to address the characteristics of a room. Although it is highly recommended, less than half of the planetariums surveyed use equalization or delay to compensate for room anomalies. Correction in the frequency and time domains is effective in correcting room response and lowering reflections [Bean et al]. Loudspeakers interact with a room to influence our perception of perceived image position, sense of spaciousness, and timbre [Toole]. Uncorrected loudspeakers will thus have detrimental effects on these parameters.

It is important to note that attempting to correct for just frequency response is not enough: phase is also an important factor. An article in a 1983 issue of the Planetarian [Hoffman et al.] attempted to describe the need for improving audio in planetariums, especially for prerecorded programming. Although it was a unique study for planetariums, the focus was only on frequency response and RT60® values.

The impact of having uncorrected loudspeakers at one venue for a given program is that audience members will have very different experiences of that program. It stands to reason that differences will also be heard from one venue to the next. Other perceptions, such as whether a mix sounds “muddy,” “murky,” or “thin,” and even speech intelligibility are certainly impacted. More to the point, uncorrected loudspeakers pose an obstacle to the goal of effectively sharing content.

Collecting Data

Our team gathered data from Gates, which currently does not do any loudspeaker correction, using 9 microphone positions, exciting each of the 16 loudspeakers with pink noise 3.

which gave us 144 sound files to analyze.

With this data, we could only look forward to doing frequency-based correction by either buying 16 graphic equalizers, or manually attempting to use the Media Matrix or Lake Huron software to insert an EQ on each channel.

We might also have had to decide which position was the optimal position to measure any changes we made. This initial approach did not take into consideration any correction for phase or delay; rather, it was meant to illustrate differences in frequency response with respect to seating location.

The data illustrates the wild variances in response at the nine locations measured for each loudspeaker. Here are just two of the mic positions recording a single source:

The data in Figures 3 and 4 (next page) clearly shows the kind of frequency differences that would be experienced by individual audience members.

At point “B,” bass frequencies are louder, and there is a sharp dip near 2 kHz, a frequency related to the “presence” of vocals. At point “A,” there is an abundance of energy at 800 Hz. Based solely on these two examples, it is possible that a listener at point “B” might perceive a boomy mix with indistinct narration, and a listener at point “A” might perceive a boxy, hollow mix.

Of course, the problem is compounded when multiple loudspeakers interact with each other. Over 70% of respondents to our survey indicate they use 5.1 systems or higher. The number of loudspeakers at planetariums means that a faster and more accurate way of achieving loudspeaker correction is desirable. Such devices do exist, and include the Optimizer by Trinnov, among others.

Loudspeaker Placement

There are currently no standards among...
planetariums about speaker arrangement. Each planetarium must therefore either create a custom, in-house mix or recreate a basic surround mix played back over a certain number of speakers. This makes work towards standardization difficult, but with stereo, L-C-R and 5.1 setups as a starting point, it’s possible to arrive at consensus for general production elements.

**Loudspeaker Remapping**

One promising application of current audio technology is the ability to perform speaker “remapping.” The basic concept is to “remap” or “spatialize” a surround setup from its original speaker format into a different speaker configuration. This would allow for the playback of, say, a 5.1 (5 main channels and 1 subwoofer) surround mix over the 16.4 loudspeakers (16 main speakers and four subwoofers) in the dome. Most importantly, remapping technology might also provide a key to sharing S1 content between two venues with different loudspeaker arrangements.

**Seating Arrangements**

The variety of seating arrangements with respect to the domed viewing area also presents an area of concern for content producers. Some are “theater style” with all of the audience facing forward and looking ahead or above, while other venues offer circular seating, on a flat floor where all audience members look straight up at the screen. Therefore, placement of the main dialog channels from one venue to the next can be a challenge. Additionally, theater sizes range from a few dozen seats to almost 400 seats.

**Informal Listening Sessions**

So what are the “real world” impacts of this theory and data? Our team did some “before and after” comparisons in Denver, using the Trinnov Optimizer. With our research team standing in various places in the theater, we played speech samples through a number of loudspeakers used to remap the different S1 channels: Left, Right, Center, Left Surround, Right Surround, and Low Frequency Extension, which is comprised only of low frequencies and is played through a subwoofer.

Without loudspeaker correction, team members pointed to different locations in the dome in order to indicate from which direction they heard the sound. In one test, the “right channel” was played alone. The team was asked to point at the direction where they perceived the sound. Everyone pointed to a different direction.

Then, as the sound played again, the loudspeaker correction was engaged, and the team members all moved their fingers to point towards the same area. This was an exciting and encouraging result that could indicate improvements in localization are achievable.

At Chabot Planetarium in Oakland, employees (who did not specialize in audio) were asked for their opinions of the corrected versus uncorrected mix of two shows, *Black Holes: The Other Side of Infinity* and *Sonic Vision*. Their comments included: “narrator is much more compelling with correction,” “uncorrected sound somewhat distorted,” “crisper audio (with correction),” “better balance in low frequency (with correction),” and “the corrected show has much more audio information since the bass is no longer dominant.”

For the show *Sonic Vision*, which has electronic beats, some listeners wanted the profound bass, which is part of the style for that genre of music. However, there was a noticeable increase of clarity for the hi-hat cymbals, which practically disappeared without correction, but sounded clean with the correction applied.

**Production**

Audio needs can be as simple as using a public address system to amplify a presenter’s narration. However, for larger productions, some planetariums produce their own shows, which can be live or prerecorded (or a hybrid of both). For example, a show might have a live narrator with prerecorded visuals and audio. Another event might feature live musicians and live visual “navigation” through the universe. Other visuals can include laser shows or, as is currently being explored, computer “visualizer” programs with audio “vee-jays.”

**Prerecorded Programming**

The most popular editing tools used by planetariums that produce and edit their own shows include: Pro Tools, Adobe Audition, Nuendo, and Vegas. Almost half of the planetariums do stereo only, but 54% of planetariums indicate they do accommodate shows in S1.

Despite the lack of consensus regarding speaker configuration and correction, planetarium operators have found ways of dealing with the myriad of issues related to sharing content.

The most troublesome aspects of doing remixes reported by our respondents were: 1) trying to balance music with narration, and 2) addressing intelligibility problems. However, some theatres did report that they didn’t make any changes to incoming programming.

With regards to sharing content, respondents were asked, “Beyond simple volume control, what aspects of the mix do you control?” The most common answer was “equalization,” followed by panning, foreign language track insertion, track remapping, downmixing, and spatialization.

These types of activities will continue due to the different set ups at each venue, but hopefully the need to re-equalize programming would decrease once operators start adopting some recommended changes to their loudspeaker setups.

**Live Programming Elements**

Many planetariums also do live events; 68.7% of those surveyed responded that they do programming other than prerecorded shows, and 13 of those have live concerts featuring anything from chamber music to electronic music. Other activities include NASA broadcasts, “star talks,” classes, lectures, and laser shows.

The narrator’s voice is the biggest determinant of perceived audio quality. Not only is in-
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... over 90% of respondents said they would want some sort of standardization for sharing content and audio quality.

tellibility important, but anomalies such as comb filtering, which makes a voice sound as if it's coming through a vacuum hose, and localization errors are easy to detect with a single voice.

The convention for cinema is to have the narrator's voice panned to the center; however, in a domed environment, there is no consensus on where "center" is. For example, if the dome is tilted so that part of the hemisphere is in front of the audience, will "center" be a speaker located directly in front of the listener? Or the top of the hemisphere?

If the dome is horizontal, so that the audience is seated below the hemisphere, and all the seats are on a flat surface, will "center" be a speaker located at the apex of the dome?

At Chabot Planetarium, the production team received a show (Black Holes) that originated at Gates Planetarium. The attempt was to spatialize the voice by putting a little in all speakers.

However, the precedence effect took over, and the narrator's voice appeared to come from the side of the screen nearest the listener. The attempt to widen the narrator's voice by simply adding them to left and right channels worked to the detriment of the mix.

At Gates, the narration channel does come from a center speaker in front of the listener. The planetarium tries to stay away from a "voice of God" effect, where the voice comes from all around. This approach might be preferable in terms of the psychological effect of having the narrator speaking directly "to you," instead of "at you." One drawback of using a single loudspeaker for narration could be that the voice is too "dry" or "lifeless."

For both examples, a judicious amount of reverb sent to neighboring channels with the voice assigned to the center speaker might help "make the voice bigger."

Envelopment vs. Localization

It is desirable to have sound effects that match the location of objects on the screen, such as shooting stars, or the sense of traveling past a planet on the right, for instance. For these elements, localization is important.

Thankfully, the visual component does help mitigate localization error; however, if major reflections and localization errors exist, they will be distracting [Holman]. It has been observed at Gates that high frequency content from the rear reflects from the front—to such an extent that the sound appears to originate from the front.

In most cases, music and some effects should be enveloping, and give a more immersive feel. The need for localization is not so important here, but high-frequency, percussive elements (such as hi-hat cymbals and other percussion, sound effect "whooshes," etc.) can give away problems in the room.

Finally, it is desirable that the distinction is made between "enveloping" and "immersive" versus "washed" and "indistinct." Some amount of education and listening demos should be done with planetarium operators in order to show the difference.

Delivery

A program can be shared among planetariums in a number of ways. Attempts at standard practices seem to be adopted from broadcast and cinema, but there are no written standards destined solely for planetariums.

Media and More

The various media accepted for playback and transfers at planetariums include DVD-ROM, DVD-Video, DVD-Audio, DTRS tapes, Laser Disc, VHS, hard drives, Betacam, DAT, and CD.

The most popular file formats of .wav and .aiff (Audio Interleaved File Format) stand out, and most systems can handle 44.1 and 48 kHz sample rates. There are some producers using 88.2, 96, and even 192 kHz rates, but these are not common. The higher sample rates arguably sound better, but take up twice as much space as the lower (44.1, 48) rates. A standard here could help save time in converting sample rates from one venue to the next.

In addition to the "usual" 5.1 channels of Left, Right, Center, Left Surround, Right Surround, and LFE, show producers often use a "top" channel. Formats such as 6.1 and 7.1 are not as common, but are being used. A variety of channel orders were given in the survey, which could be another item to consider for standardization.

As in feature-length films, some planetariums replace the main dialog track with another language, so they need a mix separated into "stems," with the dialog on one set of tracks (mono or stereo) and the music and effects on another (mono, stereo, cube, 5.1, etc.).

Not only does this allow replacement of the dialog track, it allows the show to be remixed to create a more intelligible show for a given venue’s acoustical considerations; production engineers can simply increase the level of the dialog track, if desired.

Recommendations

In conclusion, here are some recommendations as we take the next step towards a standard (or standards) based on the factors mentioned in this paper, and which consider the various types of shows, venues, and budgets involved.

In our survey, over 90% of respondents said they would want some sort of standardization for sharing content and audio quality. Planetariums would find significant benefit in equalizing and correcting for loudspeaker phase problems. Manually taking readings

4 Comb Filtering occurs when several frequencies from two sources interfere with each other and disappear. This is often the result of a timing discrepancy, where one sound starts slightly ahead of the other.

5 The "precedence effect" describes a psychoacoustic phenomenon involving two identical sounds arriving at slightly different times to the listener. The listener will perceive the sound that arrives first as the originating location of the sound.
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- Dennis Brinkman, Como Planetarium, Saint Paul, MN

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- Larry Mascotti, Mayo High School Planetarium, Rochester, MN
and correcting equalization and phase problems takes a significant amount of time and hardware. Therefore, it would seem most feasible to install and use a hardware system that will correct for phase and equalization automatically.

Standards for speaker placement might be advantageous as well. A standard similar to the ITU 5.1 specification should be implemented if content is to be shared among planetariums without remixing. Such a standard must also consider the different venue layouts. There can be some experimentation in speaker placement so long as equalization and phase correction act as a starting point.

So far, the IPS has merely recommended—informally—that the voice track be kept separate from other channels in order to allow foreign language substitutions.

This research and accompanying survey are unique in addressing the problem of sharing audio content between the wide range of planetariums worldwide. There is much work yet to be done in choosing representative theaters and production environments, performing repeatable and quantifiable listening tests, and getting the majority of the producers and facility managers on board with implementing a set of solutions to ensure great sounding shows.

Appendix: Survey Results

A total of 103 planetariums participated in this survey.

Question 1: Are you satisfied with the audio in your Planetarium? If you answered “no,” with which factors are you dissatisfied?

Some 55 (53.4%) of the 103 responding are satisfied with the audio in their venue. Of the 46.6% who are not satisfied, 54.5% cite fidelity (i.e., distortion, limited bandwidth, and intelligibility issues) as their primary complaints. 50% deem localization and difficulty panning as an issue and 45.5% responded that their theaters’ acoustics are unsatisfactory, with 31.8% agreeing that some kind of audio standardization is needed because of the difficulty presenting.

Question 2: On a scale of 1 to 10, how immersive is your VISUAL experience? 1 - Not Immersive at all 10 - Extremely Immersive.

(See Figure 5 for responses)

Question 3: On a scale of 1 to 10, how immersive is the AURAL experience? 1 - Not Immersive at all 10 - Extremely Immersive.

(See Figure 6 for responses)

Question 4: Do you have a surround system?

Out of 103 respondents, 56.4% have a surround sound system. (Two survey respondents skipped this question).

Question 5: If you answered “yes” to the above question, what kind of surround format(s) do you use?

72.2% of the respondents have a 5.1 surround sound system, 2 respondents have a Cube system, 2 respondents have a 7.1 system, and one respondent has a 3.1 system.

Question 6: Do you use any DSP (Digital Signal Processing)?

Out of 103 respondents: 69% do not use any DSP, 18% use DSP, and 13% do not know.

Question 7: Do you utilize other special equipment for individual audience members, such as headsets, or “seat shakers”?

89.1% do not use any special equipment for individual audience members. Three survey respondents skipped this question.

Question 8: Do you do programming other than prerecorded shows? (For example, live concerts).

68.7% of the 103 survey respondents use their venue for events other than pre-recorded shows.

Question 9: What types of media do you accept?

Some 82.7% (81) use DVD Data, 72.4% (71) use hard drives, 16.3% (16) use DTRS Tape (multitrack digital tape), and 28.6% (28) answered “other”.

Question 10: What formats do you accept?

63.2% accept 5.1, 14.7% accept 3.0, 11.8% accept 3.1, and 2.9% accept 7.1. Thirty-five survey respondents skipped this question.

Question 11: What sample rates do you accommodate?

Of 103 survey respondents, 63 answered this question. 81.3% (52) use 44.1 kHz, 75% (48) use 48 kHz, 23.4% (15) use 96 kHz, 15.6% (10) use 88.2 kHz, and 1 (1.6%) use 192 kHz. None of the survey respondents use 176.4 kHz.

Question 12: Would you advocate moving towards some type of standard or recommendation to facilitate: Ease of sharing? Audio quality?

Eighty-six (92.5%) and 82 (91.1%) of 103 survey respondents advocate moving toward some kind of standard or recommendation for ease of sharing and audio quality, respectively.

(Continues on Page 70)
REALM OF LIGHT
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We combined our expertise to investigate which techniques help general public members identify at least three constellations after a 55-minute live planetarium program. These programs were held in the University of Wisconsin-Milwaukee’s Manfred Olson Planetarium (UWM Planetarium), which is an intimate theater with 68 concentric seats around a 1966 Spitz A3P optomechanical projector. The stars are supplemented with images and movies projected on the dome with two mirrored LCD units.

Of the various planetarium programs offered, we decided to focus our study on general audiences that come to our Friday night shows.

The audiences that come to the UWM Planetarium are diverse in age, gender, and groupings (individuals, couples, Big Brothers/Big Sisters, nuclear and intergenerational family groups, social groups, etc). To make sure that the topics selected were of interest and that they were presented at the right level for a general audience, the authors designed a questionnaire with focused questions, such as “Can you find three constellations in the sky?”

We expected that people would be more comfortable with constellations than, say, the scale of the universe, and, indeed, 79% of the 192 respondents from a set of nine Spring 2008 shows self-reported that they could find three constellations in the sky, whereas 19% said maybe. In other words, a whopping 98% of respondents thought they could or might be able to find three constellations!

There’s Something Amiss

However, upon closer examination, we noticed something amiss. When we looked at the 62 written-in responses (out of 192) to the question asking which concept audience members found most difficult, 16 (26%) found the hardest idea was identifying constellations. In contrast, only 12 (19%) mention the scale of the universe as being the hardest concept. This finding surprised us, since we think the scale of the universe is an intrinsically harder concept than finding constellations.

After this preliminary analysis, we wondered to what extent the finding that 98% of respondents claimed they could find three constellations was a result of optimistic self-reporting. We needed an independent way of measuring whether people could, indeed, identify constellations correctly, so we added to the questionnaire a simple star map for people to mark the constellations. The star map would give us a way of measuring how many constellations audience members could find versus what they self-report.

Two different productions were used to evaluate the impact of different instructional devices: 11 shows of *Northern Lights* during fall 2008 with a total of 585 visitors and four shows of *Myths Under the Stars* in the Summer 2009 with a total of 197 audience members. The basic structure of each production was the same: a 6-12 minute interactive piece at the beginning, a 20-25 minute featured presentation that discussed the topic while showing projected images, 15 minutes of stargazing in a city and a country sky, and, finally, a 5-10 minute question and answer period.

We distributed questionnaires for people’s feedback during the question period.
Abstract: People are fascinated by the beautiful stars in the sky. We are drawn to them; we see patterns in them. Most of these patterns are not recognized universally; different cultures saw different patterns and told different stories. As recently as 1922, the International Astronomical Union organized these patterns in a system of constellations that account for the entire sky. Audiences are eager to learn the patterns in the sky that connect them to a deep-rooted appreciation of the night sky and to some of the richest stories ever; however, we came to understand from our work that people have a hard time identifying constellations. Obviously identifying many constellations requires a lot of practice, skill, and—dare we say it?—imagination.

We conclude that some of the tried-and-true techniques work well: describing the constellations with everyday terms, showing them with a laser pointer, having the audience point to them, telling the audience stories to get in the mood, and displaying projected outlines on the dome. When all of these techniques were used, about 50% of our general audience could correctly identify at least three constellations.

Jean Creighton
Sandra Toro Martell

includes 355 responses (61% of 585 visitors) from the Northern Lights audiences and 94 responses (48% of 197) from Myths Under the Stars audiences.

These two programs were selected because their featured topic had different emphases: Northern Lights focused on the physical processes that cause aurora borealis whereas Myths Under the Stars used myths as a pedagogical tool to learn the constellations. We wanted to see if different situations in terms of content and visitorship (e.g. demographics) yielded similar results in terms of ability to identify constellations.

Although the feature presentations were different, the stargazing portion was similar for both productions: the circumpolar constellations were introduced first, followed by a handful of seasonal constellations. Below, we discuss the different instructional devices used in the two productions.

When introducing the idea of constellations in Northern Lights, the presenter grouped audience members in clusters with a sweeping gesture of her hand and asked whether she could have grouped people differently. “Of course,” people replied. She went on to explain that astronomers needed a universal scheme so they could describe specific stars to each other; they treated the sky as a large puzzle and cut the sky into 88 official patches or constellations so each star belongs to one constellation.

In the stargazing portion of the program, she used a second instructional device: she described the patterns in everyday terms. Big Dipper was a shopping cart with a long curvy handle, Cassiopeia was an M or a W, Leo was a flipped question mark.

The third device, very commonly used in planetariums everywhere, was the ubiquitous laser pointer with which she traced outlines. When the lights dimmed to a country night sky level, she asked people to point to the objects they had been shown in the city lighting, such as the Big Dipper, North Star, Cassiopeia, and often one seasonal pattern (such as Leo and Cygnus).

Repetition was the fourth device employed to solidify the knowledge and build confidence among visitors. Depending on the geometry of different theaters, it may not be possible to have people point without obstructing the view of other audience members, but when it is practical, it is helpful to give people an opportunity to find and point to constellations on the dome.

In the second production, Myths Under the Stars, two more devices were added. The presenter told Greek myths connected to the summer constellations such as Hercules. She also showed artists’ renditions of constellation outlines for the Big Bear, Cassiopeia, Hercules, and Cygnus from four new constellation projectors.

Comparing Self-reporting, Ability

For both shows, audience members tended to be somewhat optimistic when they self-reported their ability to find constellations. We now examine the audience responses separately for each show.

Of the respondents from the Northern Lights shows, 270 (76%) thought that they could find three constellations (for short, “yes” respon-
was able to identify three. couldn't find three constellations in the sky not one person who said they

porting what they know: are more accurate in self-re-


people who thought they could find three+ constellations were more successful (37%) than the respondents who thought they couldn't (0%). The data suggests that people are more accurate in self-reporting what they don't know: not one person who said they couldn't find three constellations in the sky was able to identify three.

Problems with Vision

It is worth noting that 53 respondents (15%) from the Northern Light shows didn't even attempt to circle a constellation on the map. Some people wrote that they couldn't see the stars on the questionnaire since the stars were too small or they were not wearing their glasses. There is no way of knowing what the circumstances were, so we assumed that people who didn't circle constellations really couldn't find them. This assumption makes our estimates conservative. There might have been audience members who could identify constellations if they had their glasses with them.

Despite the differences in the content of the productions, we saw similar self-reporting patterns during the Myths Under the Stars shows (see Table 2): 72% of respondents thought that they could find three or more constellations while 24% of respondents thought that they might be able. We were pleased to see that in this production, 48% of respondents were able to find three or more constellations, 23% were able to find 1 or 2 constellations, and 29% were unable to find any. In other words, almost half the people across the board could identify at least 3 constellations after a 55-minute program.

As was seen with the Northern Lights shows, audience self-reporting is correlated with performance (Table 3). Some 56% of yes respondents were able to find three or more constellations, whereas 0% of the “no” respondents were able to locate three constellations.

Furthermore, the difference between the two shows is more pronounced when responses for two constellations are considered rather than with three. Of the respondents who thought they couldn't find three or more constellations, 67% of the attendees from the Myths Under the Stars shows demonstrated that they could find two (which is more than three times higher than what respondents demonstrated after seeing the Northern Lights shows).

Overall, almost half of all Myths Under the Stars respondents (48%) were able to identify three or more constellations as opposed to 32% of the Northern Light respondents.

We’re Doing Something Right

First of all, let us celebrate the fact that between 31% and 48% of a general audience who sits in a dark theater on a Friday night can demonstrate that they can find at least three constellations on a star map. We must be doing something right!

Why is there a difference of 17% between the two productions? We think there is such a difference in the ability of respondents to identify constellations because of the two additional instructional devices used the second time: the superimposed outlines of the constellations helped audiences actually “see” the patterns and the storytelling helped them retain the information about the constellations by creating imagery in their minds.

Correlation with Age

It is likely that the accuracy with which self-reporting takes place is correlated with age. One might expect that young children (under 12) might not be as skilled at identifying constellations as adults are. Children are less able to correctly identify three or more constellations (only 21% for Northern Lights and 33% for Myths Under the Stars identified three or more constellations). Almost 50% of the under 12 group in both productions (46% and 58% respectively) identified no constellations correctly.

There is more work to be done regarding the effect that age has on correctly identifying constellations.

At a glance it looks as if younger (under 17 year olds) and older (over 71 year olds) audiences tend to have a harder time finding three or more constellations. It is not clear why. Why would 13-17 year olds have a harder time identifying constellations than 18-25 year olds? A possible explanation is that adolescents in this age group are not as likely to pay attention during the explanation of how to locate and identify particular constellations.

At this age, there is a heightened interest in social relations and they may be more interested in what is going on around them in terms of what their peers are doing, especially if they came to the show with friends or fellow scout troop members. It is also possible that adolescents may respond more positively to group-based work and interactions rather than the format used, which is more lecture-style.

Another reason for the difference in ability to identify constellations might stem from different experiences. Teenagers, especially those who live in cities, have fewer opportunities to see the night sky in all its glory, so they have fewer opportunities to look for constellations.
Journey to the Stars
Narrated by Whoopi Goldberg

“Journey’ is easily the most beautiful planetarium show I have ever seen”
– New York Times

“Entertainer Whoopi Goldberg’s narration makes the complex topics seem like a thrilling tale told around a campfire.”
– Scientific American

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The Search for Life
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in their daily lives. Older people might have had more time over the life span to notice the beauty in the night sky.

**Recommendations**

Taking into account the correlations that have been discovered relative to self-reporting and identification of constellations across age groups, we feel that the following points may be helpful to other presenters when teaching people to identify constellations:

**Draw the audience’s attention:**

Include the audience in the explanation of the constellations by having them use their bodies: for example, encourage people to point to constellations during the show if it doesn’t obstruct the view of other audience members.

Consider the age of your audience: young children are probably not developmentally ready to understand the concept of a constellation, which is rather abstract. For children and adolescents, one might need more kinesthetic activities to display constellations.

Consider the age of your audience: adults over 70 years old might need more focused, brighter displays of stars than a traditional optomechanical projector can provide alone.

**Keep the audience’s attention:**

Use repetition: after showing a constellation with a laser pointer, have audience members look for the pattern on their own. Repeatedly finding the same constellation during the presentation seems to make it easier for a person to locate the constellation later.

Incorporate storytelling associated with the constellations: everyone likes a good story.

Show people outlines of even a few constellations to help audiences identify the patterns again.

These recommendations come from our work. We were interested to see what people can learn in this special environment and what techniques work best. Hopefully, our whole community can be more reflective about our pedagogical choices and the use of particular devices that help explain other interesting astronomical concepts during planetarium programs.

If using a star map to measure ability, the quality of the star map is important: contrast, background color, size of stars, number of stars shown, orientation etc. can all influence the ability to identify constellations.

Obviously identifying constellations is not the ultimate goal of planetarium programs, but it is important because it is a skill that can be acquired relatively easily by anyone and can increase interest in the night sky and astronomy in general. A little bit of mastery can draw people in to want to know more about our cosmos.

<table>
<thead>
<tr>
<th>Self report</th>
<th>Number of correctly identified constellations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>271 (76%)</td>
</tr>
<tr>
<td>Maybe</td>
<td>68 (19%)</td>
</tr>
<tr>
<td>No</td>
<td>16 (5%)</td>
</tr>
<tr>
<td>All respondents</td>
<td>31%</td>
</tr>
</tbody>
</table>

Table 1: Tabulated responses from the Northern Lights shows.

<table>
<thead>
<tr>
<th>Self report</th>
<th>Number of correctly identified constellations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>68 (72%)</td>
</tr>
<tr>
<td>Maybe</td>
<td>23 (24%)</td>
</tr>
<tr>
<td>No</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>All respondents</td>
<td>29%</td>
</tr>
</tbody>
</table>

Table 2: Tabulated responses from Myths Under the Stars shows.

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Number of constellations identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 12</td>
<td>46%</td>
</tr>
<tr>
<td>13-17</td>
<td>38%</td>
</tr>
<tr>
<td>18-25</td>
<td>15%</td>
</tr>
<tr>
<td>26-35</td>
<td>25%</td>
</tr>
<tr>
<td>36-50</td>
<td>26%</td>
</tr>
<tr>
<td>51-70</td>
<td>44%</td>
</tr>
<tr>
<td>71+</td>
<td>22%</td>
</tr>
</tbody>
</table>

Table 3: Number of constellations correctly identified versus age for Northern Lights shows.

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Number of constellations identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 12</td>
<td>58%</td>
</tr>
<tr>
<td>13-17</td>
<td>33%</td>
</tr>
<tr>
<td>18-25</td>
<td>10%</td>
</tr>
<tr>
<td>26-35</td>
<td>5%</td>
</tr>
<tr>
<td>36-50</td>
<td>35%</td>
</tr>
<tr>
<td>51-70</td>
<td>13%</td>
</tr>
<tr>
<td>71+</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4: Number of constellations correctly identified versus age for Myths Under the Stars shows.
**Visitor Questionnaire**

### About the Show

<table>
<thead>
<tr>
<th>Do you better understand Earth’s motions?</th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you find three constellations in the sky?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you enjoy the stories and myths?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were there words or ideas that should be explained more?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What idea was most interesting to you? Why?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What idea was most difficult? Why?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please circle the Big Dipper, the Little Dipper, the North Star, Cassiopeia the Queen, and whatever else you can recognize.

Please circle the picture that best describes how the earth moves.

---

### About you

- **How many times have you visited us before?**
  - First time
  - 1-2
  - 3-4
  - 5 or more
- **Age**
  - 12 or younger
  - 13-17
  - 18-25
  - 26-35
  - 36-50
  - 51-70
  - 71 or older
- **Other comments:**

---

**Thank you!**

The questionnaires. The authors permit reuse.

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(Continued from Page 11)


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[www.rudinec.com/planetarium](http://www.rudinec.com/planetarium)
In the summer of 2008, we built the first public stereoscopic dome theatre in Japan, located at the Science Museum in Tokyo. We named it the Synra Dome; synra (shinra) means “everything in the universe” in Japanese. Synra Dome, located next to the Imperial Palace, was a former IMAX theater; it features a 10-m seamless dome at an 18° tilt.

Twelve Barco projectors are used to display the INFITEC (interference filter technology) 3D presentation.

This new dome theatre will be used not only to show astronomical content, but also content from various other fields of science, arts, entertainment, and more with its immersive and interactive capabilities.

For this dome theatre I developed a full-dome content development workflow tool and brand new presentation software for interactive live shows. In this paper I’ll describe these new softwares that facilitates us the use of the fulldome environment.

Dome Previewing Tool

While creating the new fulldome movies, we quickly realized that none of us really had enough experience, especially when dealing with how objects and scenes get distorted on the dome and how the audience would feel when watching them.

To help solve this, I made a virtual dome-previewing tool called “AllSkyViewer,” with which you can project dome master movies on a virtual dome screen surface and check it from anywhere you want (see Figure 2). I have released this software as freeware; to download, check the website in References section.

I also made it work in an actual dome with multiple computers and projectors to play low-resolution dome master movies without a pre-slicing process. Using today’s powerful PC clusters, we can play 1.5k x1.5k dome master or 1k x1k cubic face with OpenGL-accelerated real-time slicing techniques. This quick virtual dome projection helps our graphics designers very much.

We found that in some cases, a user-defined safe area gives a better perception of scaling between virtual and actual domes. This version is “AllSkyViewer Pro,” released as a product.

I also added format/type conversion functions to the AllSkyViewer Pro for better con-

Abstract. In the summer of 2008, we built the first public stereoscopic dome theatre in Japan, the Synra Dome at the Science Museum, Tokyo. To optimize its fulldome content development workflow, I developed a quick dome previewing tool called AllSkyViewer/Pro. For live show programs, I also developed a unique real-time presentation tool called Quadratura. These tools make dome and immersive environments easy to use, and extend their capabilities.

First presented at Fulldome Summit, Chicago, Illinois USA, July 3 2008

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tent post process and slicing workflow (Figure 3).

We found that the inter-conversion between dome master and cubic files is useful in the post-process workflow. These days post effect editing software like AfterEffects© and Apple Motion© have 3D scene composition abilities and come with lots of powerful effects. So we converted our dome master footage to 5 cubic face files with AllSkyViewer Pro (or they can be rendered out directly as such), and imported them into these softwares as a virtual cube around a camera in the 3D composition scene.

In these scenes we can add images, movies, text layers, and 3D particles, etc. After that, we can render the composite scene as 5 cubic face movies, and finally convert them back to a single dome master movie file with AllSkyViewer Pro again.

With these optimized workflows, we could check and discuss about the dome content over and over again.

Presentation Tool
AllSkyViewer/Pro’s quick dome previewing is powerful, but editing, rendering and slicing the final dome master content needs quite long time. In our dome we have weekly live show by guest speakers, so we have to prepare fulldome presentation in only a few hours.

At early 2008, I developed a brand new real-time presentation tool for fulldome and other immersive environments. I decided that it should be easy to use, like PowerPoint©, and powerful enough to make the most of these immersive environments.

I named this product Quadratura. Not only is it a real-time presentation tool, but also a dramatically fast immersive content designing tool. (Figure 4)

Screen Surface Coordinates
In usual implementation, objects are placed in an orthogonal coordinate system, so their spatial positions are represented as x, y and z values. But for presentation use, most objects, such as images, movies and text, should be facing the audience. So in Quadratura, I adopted a “screen surface + depth” coordinates system to represent objects’ positions. It allows intuitive drag and drop object placement like in PowerPoint. Better still, with this coordinate system, one can use the same content both on flat screens and dome screens by simply changing the base coordinate system according to the new screen shape. All objects are actually placed in 3D space, so it supports stereoscopic rendering as well.

View Styles
During interactive presentations, you can put additional objects at any time and any place that you want. To get the most out of the immersive environment, you should check the entire view of the presentation space and be able to layout the objects in this view.

In Quadratura, you can change view style of the operation console at anytime. It has three view styles: first person, third person, and dome master. With these views, you can quickly grasp the entire layout of objects and arrange them intuitively.

Object Types
In Quadratura, you can add objects just by dragging and dropping the files from the explorer windows onto the screen surface in the view area.

Currently supported object types are images (with alpha channels, most common formats and sequential images), movies (with alpha, most common formats), FITS files (real-time exposure processing supported), 3D models, texts and all-sky images/movies (with alpha, dome master, panorama and cubic files), free drawing, web pages and live video capture (from web cam to HD capture). All these types of objects can be placed and composit-
ed in 3D space. I found that the composition of all-sky movies with alpha channel is useful for powerful fulldome special effects.

Currently I have plans to add some additional object types, such as real-time particles, 3D avatar characters, and so on.

Presentation Assistance

Once the objects are placed in the presentation space, you can store the current objects and layout as a “slide.” Notice that in this tool, a slide does not mean a 2D image, but a whole 3D scene environment. Like PowerPoint, you can do entire presentation by showing slides sequentially. In the slide list interface, you can directly access each slide to show or edit it. You can also organize slides by using folders like usual file system.

To assist the presentation, Quadratura has a virtual 3D cursor and free drawing pens. These are quite useful for marking up the important points. Of course these cursor and pens can move across the entire area of the screen surface projected by different PCs.

Timeline Motion Control

For content creation, Quadratura has a timeline-based animation designing tool [10]. It looks like Adobe Flash®, Director© and any other non-linear editing tools and 3DCG packages, so most content creators will be familiar with it. All objects’ positions, rotations, scales, visibilities and other properties can be controlled by key frames, scripts and external devices. The timeline also has background music and sound effects lines, a timing control line and frame control line for building complicated content such as kiosk applications.

All operations in Quadratura are implemented as internal script commands. You can record or describe your interactive presentation as script lines and replay it later. This replay capability allows the rendering of the entire presentation as a dome master movie. You can also write useful macro scripts for your presentations.

Projection Correction

If you have an optical planetarium facility, you can project the Quadratura scene over the starry scene with as many projectors as you want. This tool comes with integrated real-time slicing functionalities (distortion correction and edge blending), so you can fill the displayed area as large as you want. These projection corrections are designed not only for domes, but for any screen shapes, so you can use this presentation tool for any kind of immersive theatre. With this real-time slicing functionality, you can drag and distort the displayed image directly. It is extremely useful for quick projector adjustments.

Extensible Platform

The last and most important feature of Quadratura is that it could be an extensible platform for OpenGL-based immersive 3D real-time applications. I integrated it with Mitaka Pro®, a real-time space simulator, which originally was developed by the 4D2U Project, to make it full-featured astronomy presentation software.

Quadratura works as an overlay plane of the space scene, and shares the projection correction and setup with the base application Mitaka Pro.

Integration of Quadratura to this kind of interactive contents gives great usability to it. In the next step I’ll integrate Quadratura with SCISS Uniview™, and try to work with other visualization software.

References

To check out All-SkyViewer/Pro, go to orihalcon.jp/allskyviewer/index_e.html.

For Quadratura, go to orihalcon.jp/quadratura/index_e.html.
A Word of Introduction

Kappa Crucis Mobile Planetarium is a cultural enterprise dedicated to the dissemination of astronomy. Since 2005 we have been traveling around the country and visiting a variety of educational and cultural institutions, offering sessions addressed to an audience ranging from children to adults.

In our country (Uruguay, a small South American country bordering on Argentina and Brazil) there is a total population of over three million, with one and a half million people living in Montevideo, the country’s capital city, and the rest distributed among the 19 provinces called departments. Our project visited each of the 19 capital cities, the population of which ranged between 20,000 and 90,000 people.

It would be useful to point out that scientific public outreach, especially in the field of astronomy, used to be limited to the Municipal Planetarium, and located in Montevideo. As of the year 2005, through the Kappa Crucis project, this situation was reversed and communities across the entire country now are starting to have access to that kind of information.

The 19 Capital Cities Program

The International Year of Astronomy provided an opportunity for us to undertake an ambitious enterprise.

The planning started in February, 2008. We had to do significant research to be able to design and construct the dome to be used in the project all by ourselves. The demanding construction process lasted for six months. What does the dome look like? Made up of 41 self-sustaining glass fiber and expanded polyurethane panels, it is 5.5 m in height and 8 m in diameter.

Another enhancing feature to add to our presentations was a digital projection system. Our choice was to incorporate the Digitarium projection system, which offered a wide range of possibilities, going from the ordinary sky projection to fulldome materials.

While the dome was being constructed, we prepared scripts to accompany the sessions. In order to do so, we counted on a multidisciplinary team composed of elementary and high school teachers and professional and amateur astronomers. We devised a well-thought-out session which included Galileo Galilei and the importance of his discoveries and adapted it to the different levels of the prospective students in terms of age groups as well as cognitive competence.

This also encouraged us to generate supplementary materials to complement the sessions.

The remaining phase was to make contacts with the different institutions and authorities and start to elaborate our agenda.

Objectives of the Program

Our project had the following objectives:

- firstly, to contribute to the process of the
popularization of science and the development of the population’s scientific culture;
• secondly, to motivate, especially the children, to approach astronomy, awakening their interest in topics related to the universe; and
• thirdly, to support teachers’ daily work by providing them with an advanced pedagogic tool.

On the other hand, our main specific objectives were to promote scientific and technological knowledge in the framework of the International Year of Astronomy 2009 and to reach the 19 capital cities of Uruguay between April and October 2009, decentralizing and democratizing a cultural space for the promotion of science and technology.

Development of the Program

The key concept of our project was traveling around each of the 19 most important cities in Uruguay to offer educational sessions not only to students at both the primary and secondary levels of schooling, but also to the rest of the community.

A feature that was coordinated with the presentations was the exhibition “From Earth to the Universe,” displayed as a series of large-sized images with backlight illumination arranged alongside a 12-m gallery providing access to the dome.

To describe the work involved in the project, we should begin by pointing out that the equipment was transported in three vehicles: a truck, a van and a private car. Eight workers were hired to put up the dome, a 10-hour process, and later take it down, which took another 5 hours. Every arrival to a new location meant the same procedure.

There were, on average, 9 daily sessions. Each of these presentations lasted 40 minutes. It started with an introduction on the International Year of Astronomy that introduced participants to Galileo Galilei and the importance of his discoveries. After that, they had the chance to observe a projection of the night sky of Uruguay while being made aware of its significance in terms of cultural heritage.

The Digitarium system played a crucial role in this phase and also made the work of the planetarian easier and smoother. Participants were amazed with the fulldome technology.

At the end of each presentation, participants were assigned different observation tasks related to the sky at night to be performed on their own regardless of their location. In order to help carry out these tasks, we drew a map of the sky as visible from our latitude and gave it out to teachers for further distribution to students.

Feedback and Results

In order to achieve our initially-stated objectives, we also organized the secretarial work and specific procedures from our headquarters in Montevideo. Upon arrival of each group of students, the teacher was given an evaluation form to enter his or her opinion or level of satisfaction. In this way, we gathered and later processed data regarding the number of teachers attending and feedback on the project. The completed forms added up to 1,222.

A grid was also used to keep a record of the schools and groups attending. Here are some relevant figures showing the reach of our project:

(Continues on Page 74)
welcome to a new WORLD

introducing The Layered Earth - the first interactive, realtime 3D earth science software and curriculum for digital domes

available in 2011 for Spitz SciDome systems

visit www.thelayeredearth.com to learn more about The Layered Earth for the classroom
There is nothing common in the two objects that constitute the headline except that both are in India and one of us (Suhas) happened to visit both recently. Intrigued? Let us complete the story.

Most planetarians would agree that we cannot accomplish the goal of popularizing astronomy through planetariums by merely dishing out good planetarium shows. How many repeat visits take place? Are the planetarium programs connected in a way that they take the visitor to a higher level of understanding every next visit? Conduct a survey and most likely you will find that the show themes are often a reflection of the likes, dislikes and whims of the current planetarium director.

Like most planetariums, Nehru Planetarium in Mumbai (which celebrated its 33rd anniversary on 3 March 2010) realized this long ago and has offered a vast variety of activities to support its astronomy popularization program. Lectures by eminent scientists, workshops on telescope making, quizzes, painting, elocution and poetry competitions, designing sundials and star charts are a few of the activities targeted at students from school to university level.

The result has been quite satisfying. Right from its inception in 1977 there has been a demand from a section of visitors for a basic course in astronomy for all ages. An attempt was made in the 1980s and a “Basic Course in Astronomy” was started by the then Director Dr. V. S. Venkatavaradan. He and his colleagues ran the entire show during summer vacations, which was also the duration of the course.

It was a loosely-knit basic course, which its detractors called “astronomy for lovers and loafers,” yet it was a valiant attempt. The director himself did 90% of the teaching and there were no admission criteria or fee. A person of any age could walk in and join.

Much later, in August 1997, Nehru Planetarium and the Extramural Department of the University of Mumbai (www.extramural.org/astronomy.html) joined hands and our “Course in Astronomy & Astrophysics” really took off.

This course begins in June and ends in February and the classes are held on Sundays in the “Hall of Quest” of the planetarium. People 18 and older are eligible to enroll. A modest course fee as well as an excursion fee is charged and the number of students on roll is restricted to around 30.

Mrs. Mugdha Karnik, director of Extra Mural Studies of Mumbai University, organizes curriculum advisory committee meetings every year and the course contents are updated regularly every year. Some of our planetarium staff members, scientists, and astronomers drawn from colleges of Mumbai University and some research institutes in Mumbai serve as the faculty and are paid an honorarium on a per lecture basis.
You would notice that apart from the 19 or so courses there is also an emphasis on hands-on astronomy, night-sky watching, and an excursion to an observatory or a site that may have some astronomical significance.

Two Destinations
This year the excursion was planned for two exciting destinations, the Giant Metrewave Radio Telescope (gmrtn.crcrift.res.in) and Lonar Lake. Customarily, some teachers accompany the students on such a trip and this year this honor was shared by one of the authors (Suhas) and Prof. Mahesh Shetti of Wilson College, Mumbai, both members of our course faculty.

On 8 January 2010 two of us with 30 students in tow left for GMRT, which is located in the village Khodad near the city of Pune, about 130 kilometers from Mumbai. It is the world's largest radio telescope array working at metre wavelengths. The students were awestruck by the sheer size of the large dishes of steel that moved in unison to track heavenly objects.

The GMRT was built and is operated by the National Centre for Radio Astrophysics of the Tata Institute of Fundamental Research (NCRA-TIFR) Mumbai. It consists of 30 fully-steerable gigantic parabolic dishes of 45 meters in diameter.

The number and configuration of the dishes was optimized to meet the principal astrophysical objectives, which require sensitivity at high angular resolution as well as the ability to image radio emission from diffuse extended regions. Fourteen of the 30 dishes are located more or less randomly in a compact central array in a region of about one square kilometer.

The remaining 16 dishes are spread out along the three arms of an approximately Y-shaped configuration over a much larger region, with the longest interferometric baseline of about 25 km.

The correlation of radio signals from all the 435 possible pairs of antennas or interferometers over several hours thus enable radio images of celestial objects to be synthesized with a resolution equivalent to a single gigantic dish 25 km in diameter!

The array operates in six frequency bands centered on 50, 153, 233, 325, 610 and 1420 MHz, corresponding to a wavelength range of about 8 m to 20 cm. The highest angular resolution achievable ranges from about 60 arc seconds at the lowest frequencies to about 2 arc seconds at 1.4 GHz.

GMRT is an indigenous project that became fully operational in 1999 and was opened to the world community of astronomers in 2002. The construction of 30 large dishes at a relatively small cost has been possible due to an important technological breakthrough achieved by Indian scientists and engineers in the design of light-weight, low-cost dishes. The design is based on what is being called the “SMART” concept, for Stretch Mesh Attached to Rope Trusses.

An Unconventional Structure

The dishes have been made light weight by replacing the conventional back up structure by a series of rope trusses (made of thin stainless steel wire ropes) stretched between 16 parabolic frames made of tubular steel. The low solidity design cuts down the wind forces by a large factor and is particularly suited to conditions in India. The weight of a disk is about 80 tons and the counter-weight is about 40 tons. The dishes have alt-az mounts.

The large size of the parabolic dishes implies that GMRT has over three times the collecting area of the Very Large Array (VLA) in New Mexico, USA, which consists of 27 antennas of 25m diameter and is presently the world’s largest aperture synthesis telescope operating at centimeter wavelengths.

At 327 MHz, GMRT is about eight times more sensitive than VLA because of the larger collecting area, higher efficiency of the antennas, and a substantially wider usable bandwidth because of the low level of man-made radio interference in India.

It is a national facility and is being used extensively by astronomers to study and learn about astronomical objects emitting in radio frequencies. One of the science projects of GMRT is to detect hydrogen from distant galaxies. Hydrogen forms a major constituent from which galaxies formed, and atomic hydrogen emits radio emission at 21 cm.

The GMRT has contributed to studies of the solar system by studying a variety of solar and planetary radio bursts, including those from Saturn and ionospheres and magnetospheres of some planets by observing scintillations of radio sources passing close to the planet. It can also be used for detecting the presence of Jupiter-like planets orbiting around nearby stars.

Lonar Meteoritic Crater

We traveled overnight in our bus and covered 338 km to reach Lonar Lake the next day. Luckily for us we had in our bus a contingent of six geology students from another course also run by Mumbai University Extra-mural Department and their team leader Dr. Rohinton Avasia, former head of the Geology Department at St. Xavier’s College, Mumbai.

Dr. Avasia and a local retired school principal, Mr. Sudhakar Bugdane, took us around the lake and to several ancient temples that dot that area. They gave us detailed information about the Lonar Crater and the stone temples, constructed in the 12th-13th centu...
Dome3D’s show SpacePark360 is a 38-minute, 9-ride customizable show that takes audiences on a wild immersive ride through the solar system. From the tops of Jupiter’s clouds to the icy depths of Neptune’s moon Triton, each location heightens the experience.

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- Stephen Pagnani, Head of Marketing, Cranbrook Institute of Science

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In late January and early February 2010 I spent a delightful fortnight in India, visiting several astronomical and planetarium-related sites and, in particular, enjoying the company of several of our planetarium colleagues there.

One of my first activities was to visit the Jantar Mantar in Jaipur, site of the largest of the five famous observatories built by Jai Singh II between 1724 and 1727. The observatories are all “sight based”—that is, they contain no optical instruments. Basically, the instruments are all either sundials or devices to measure the positions of celestial bodies. The most famous—and most photographed—of these instruments is the Samrat Yantra, the largest sundial at Jaipur.

Of the other three surviving observatories, another is in Delhi itself, and it is there that I met up with Rathnasree Nandivada, director of the Nehru Planetarium in Delhi, who is an expert on these fascinating structures. On the morning of my visit to the Delhi site, several students met up with us. Their enthusiasm was obvious as they attentively watched Rathnasree explain how to perform calculations explaining the method of operation of the instruments.

Later in the day, I was pleased to visit the Nehru Planetarium itself as Rathnasree’s guest. I was invited to present a talk between public shows at the planetarium, and was honoured to have an appreciable audience gather for my presentation.

The visit also gave me the opportunity to speak with Rathnasree about the planetariums of India and our desire to further consolidate and formalise the Indian planetarium group.

Following my visit to Delhi, I flew to Pune, and subsequently travelled to the site of the Giant Metrewave Radio Telescope (the GMRT). (See related story on page 33.) This was in order to give a talk about the life of Grote Reber, the world’s first radio astronomer and to present, together with colleague David Jauncey, a small box of Reber’s ashes. The superb hospitality of the Pune astronomers was memorable, as was a sign on the rear of my bedroom door warning of a leopard that had been seen near some of the radio dishes!

I then travelled to Mumbai, some five hours’ drive away, to meet up with Piyush Pandey, director of Mumbai’s Nehru Planetarium, and Program Director Suhas Naik-Satam. Piyush and I spent quite some time discussing the future of the Indian planetarium group.

As a result of this, I feel confident that India is heading toward an all-inclusive group that will soon be meeting more regularly. A newsletter is being instigated, and already both Piyush and Rathnasree have done some work in this regard.

I sat in on Mumbai’s Saturday afternoon planetarium show, an all-digital show which was attended by some 400 people. It was all very impressive, including a sundial in the planetarium grounds that was designed by Piyush himself.

I look forward to my next visit to India. There is certainly a great deal to see, and I have no doubt that our planetarium friends there will be very welcoming to all!

From Top: The scale on the sundial known as the Laghu Samrat Yantra at Jaipur; the Samrat Yantra, the largest sundial at Jaipur; Director of the Nehru Planetarium in Delhi, Rathnasree Nandivada, explains the instruments of the Jantar Mantar in Delhi to students; and the Zeiss projector at the Nehru Planetarium in Delhi. All photos by Martin George.
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An amazing view, all in real-time

This page features just a few of the real-time features in Release 2. And although this page is static, in a Definiti theater the images are full of movement! Sky Touch particles (shown here as green, white, and blue) flow with real wind current forecasts. The asteroids you can see at the top are all dynamic, allowing for the study of the effects of gravity from nearby large bodies. Even the beautiful new 3D Aurora shimmers in real-time.

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- There are important similarities and differences between Earth and other planets

Visually dramatic and documentary in style, it includes comparisons of Earth and its nearest neighbors, the Moon and Venus. It highlights their histories and the delicate atmospheric balance required to support life. We are then immersed in the story of Earth’s climate, travelling through time to view the dependent interaction between climate and life during the evolution of our planet. A mass extinction event, an ice-age and the advent of the industrial revolution are described in detail.

The presentation helps audiences to understand how scientists study constant climate change and how we, as humans, have the opportunity to impact the climate, for better or worse.

Our Living Climate—the greatest scientific challenge of our time.

Produced by Museum Victoria. Approximate running time 28 minutes. Suitable for ages 10 and over.

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It’s a spectacular, up close glimpse of the Earth’s most destructive forces! Narrated by Kevin Bacon. Approximate running time 40 minutes. Transformed from giant-screen film by Sky-Skan.

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We call ourselves planetarians. Kids in Maine call me the bubble man. Northern Stars Planetarium was created in 1987 from my desire to live in central Maine, an area without a planetarium. Between 1983 and 1987 I directed the planetarium at the Francis Malcolm Science Learning Center in northern Maine, where, with a tight budget, creativity, and ingenuity, I succeeded in producing numerous public and school shows with few resources. Such success made me confident I could start my own planetarium business. With perhaps a somewhat naïve confidence I moved from a traditional hard dome to the “bubble” of a portable.

With no property or children, I had nothing to lose but my pride. I contacted Learning Technologies Inc., the STARLAB manufacturer at the time, and was told they didn’t sell to individuals, only institutions. With perseverance and persuasion, they accepted my order and my first 4.9-m dome arrived three months later.

I asked myself “what could I do with a portable? How could I make a living?” I thought simultaneously about show offerings and equipment. I knew I’d have to do hundreds of shows each year to make a living. I’d need a variety of offerings, both for my own sanity and to fill the needs of school curricula.

To meet these goals I considered adding a couple of slide projectors and a handful of special effects to the basic STARLAB. Everything had to be preassembled and mounted in some type of projection box for quick and easy set up. It was the perfect challenge. How far could I push the envelope?

Six months later I had pushed the envelope further than I originally planned. I had built a portable console with 20 special effect projectors mounted inside along with controls to remotely run four Ektagraphic slide projectors in a separate projection box. Add in a Bose Acoustic Wave sound system, a dozen shows, a brochure mailing and a Volkswagen van and I was ready business.

At a MAPS conference, when I told colleagues what I was doing, I received a combination of smiles, intrigue and disbelief. Portable domes at the time weren’t fully accepted as viable planetariums. Some colleagues supported my efforts, while others thought I was making a mistake. Skeptics were full of advice. I was told I didn’t understand traveling in winter. I should drop this foolishness and apply for a position at one of the larger domes—that was the proper career path. One vendor who was giving out free slide sets refused me a set as he was only giving them to real planetariums.

It’s been more than 20 years since that conference. “Real” planetarium or not, today I run a successful portable planetarium. Though with today’s digital all-sky projections becoming the new norm, I sometimes question what kind of antique cyclorama I’m operating. Actually, I’m happy with my personal evolution of equipment. Currently I am phasing out two of my four slide projectors and using a laptop and video projector—both lighter in weight than the Ektagraphics on their rack mount and the four milk crates of carousels (6 carousels per crate) that support my show offerings. I still like most of my special effect projectors and I’ll always keep at least one Ektagraphic active for the occasional slew or that really clean planetary image floating in the stars.

Advertising and paperwork have evolved too. When I started, I had a two-color brochure (it was all I could afford) and program list that I mailed to schools and libraries twice a year. I produced a 12-page teacher’s guide for each show I offered and spent hours photocopying and mailing them to schools that scheduled.

Today, I do only one targeted mailing per year and my brochure is multicolor and inexpensively self-produced. Most of my advertising comes through my monthly e-newsletter and website. Teacher’s guides are available as free downloads and contracts are sent by email. It frees up a lot of time formerly spent copying, sorting, stuffing and mailing. I use little paper, ink or postage these days.

In the past 23 years I have worn out one dome and replaced it with two—another regular dome that holds 30 people and a superdome that accommodates 65. Schools pick which dome best fits their needs. The superdome is more economical and has a bigger sky, while the regular dome will fit in a classroom and is more intimate. All of my current 28 shows are available in either dome.

Since acquiring the super dome in 1996 my yearly attendance has increased from 13,000 to more than 18,000 students, while the number of shows given has dropped from more than 500 per year to under 300—all while traveling the sometimes wintry roads of rural Maine!

I have not taken the conventional path moving up the planetarium ladder. There are times when I get a bit envious of the expensive gear I see at conferences. Fulldome video projection can be stunning and immersive. Yet I don’t lose sleep over my choices that have kept me from the expensive high-tech gadgets. When I see such shows I am often impressed. It’s like Hollywood with good science: flashy, clean, and inspiring. I think all those qualities are important in any planetarium show, regardless of the technology. That’s why we old-timers spent so many hours masking slides and making our shows as clean and realistic as possible. We all inspire our audiences in our own unique ways. We inspire them to look up, to learn more, and to...

(Continues on Page 70)
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Dear Colleagues and Fellow Planetarians

Well everyone, the time is nigh: the IPS 2010 conference at Alexandria, Egypt is good to go. I do hope that all of you who can will try to get there as this is a landmark event for the IPS.

It is the first conference that we will have held on the African continent, and it will be the first in the Arabic-speaking world. I think that both these elements are very important, as one of our prime functions is the promotion of our profession worldwide so that children all over the planet can learn about the mysteries of the cosmos in their local planetariums. We hope that this conference may help lead to the formation of an Arabic-speaking affiliate group eligible to join the IPS Council.

During the meeting in Alexandria, we are looking forward to the change in perspective and of pace, as the Egyptian people are immensely proud of their long history. We also anticipate learning more and experiencing firsthand the impressive artifacts of civilization in the Nile Valley, and the undoubted importance of astronomical observations to this earliest of human societies.

When I first put my vision for the future to IPS members in Melbourne to persuade you to vote for me, I did so on a platform of further internationalizing our Society. In seeking support for this aim, I believe that I was following in the footsteps of previous IPS presidents who had also striven to achieve this target.

One result of this effort has been the recent admission of the Brazilian planetariums as affiliate members of the IPS Council. I look forward to this addition to the IPS family becoming an exemplar for other planetarium groupings and associations around the world to join IPS.

Lessons from Labour

As I write this article, the UK is in the middle of a general election campaign for a new national government. The incumbent party is called the Labour Party, as it grew from the organized labour movement, and is still supported and funded by the trade unions. Their slogan in the past was “Unity is Strength” and this has relevance to the IPS.

While appreciating that unity of effort and purpose is a strong foundation, especially when presenting a case for the retention of an astronomy planetarium programme to less-than-supportive accountants and budget people, I also strongly believe in the value of diversity.

I think that the IPS is strengthened by the diversity of our membership. I have written before about the diverse viewpoints of our members; for example, the passionately-held views that fuel endless discussions on the relative merits of different projection systems. The IPS includes a large number of members who are individuals working alone with their portable planetariums as well as huge state-of-the-art facilities like the ultra modern Beijing Planetarium with multiple theatre spaces and huge numbers of visitors.

Our Worldview is Important

It is our ability in IPS to collect such a diversity of opinion under one all-encompassing umbrella and worldview that is hugely beneficial. It also provides us with a great platform and wealth of experience that can be used to advise our funders and administrators. As I write this, I am mindful of the current turmoil in the USA over continuing budget support for small school-based planetariums.

Our diversity also shows that the IPS is a microcosm of the real world, and that we already serve a huge section of the human community. The little boys and girls in Cape Town, South Africa and Niteroi, Brazil who dream of becoming scientists are inspired by their planetarium presenters in the same way as those who are fortunate enough to live in the countries of the European Union and the USA.

I believe that it is the job of the IPS President and the IPS Council to expand our reach and to encourage groups to form an alliance of common interest (“unity”) so that they may be eligible to join and benefit from the diversity of our collective experience.

Lessons Remembered

I have been following a very informative and visually stimulating new TV series on the Wonders of the Solar System, which has just been broadcast by BBC2 in the UK. It is presented by physicist Professor Brian Cox of the University of Manchester and is well worth a look. I guess that it may make the public broadcasting channels in North America, and it will surely appear as a DVD set.

The program has prompted me to think more about teaching astronomy. I firmly believe that good teachers are born, not made. I assume that many of you may have had the mind-expending experience of working under the direction of a good teacher or of a gifted mentor who really inspired you to do well.

My most memorable teachers taught physics and chemistry at the school I attended in Belfast in the 1960s. Brian Anderson was the chemistry teacher with a passionate, vulpine personality. He took no prisoners; his mantra was that you had to know your stuff. It was your job to learn it and then to use it. He explained to us the fabulous precision of the periodic table and what you could learn and infer from it.

The physics teacher was Billy Brown, a softly-spoken avuncular Scot, who skillfully wove together the disparate parts of the jigsaw that was modern physics. His gift was that we should never take anything for granted and that we must do the experiments for ourselves: do the work, make the observations and apply the maths. We were given the tools and told to form the hypotheses and theories for ourselves; we were not to be concerned about failures. Mistakes are the pathway to experience ad a better theory.

I do fear that the modern UK education system is more about ideology and ticking boxes rather than the great educational experience which can be achieved by carefully targeted digressions.

Lessons from the Best Teachers

The best teachers can conjure magic from thin air, exploiting our human susceptibility for good stories and our vivid imaginations. In my previous experience as a geology professor, I used to ask my students to close their eyes to visualize what an ancient undersea environment may have looked like. This blocks out visual distractions, thus preventing the hardwired ability to detect small movements and changes in our visual field which might have kept us safe from predators when we lived on the savannas of Africa.

This visualization technique is also used by sports coaches asking that their aspirant winners see themselves coming first and standing in the podium to get the gold. We do it, too, every day in the planetarium dome. It’s all in the mind.

So too, we can ask our small visitors to see themselves, clad in a space suit, scaling Olympus Mons on Mars. I am always impressed by the unfettered power of a primary school child’s imagination, and their ability to see themselves as space explorers. Try it out. You will be pleasantly surprised.

I wish you all dark and clear skies, wherever you are.
“Students, here is your June and July summer reading lists. You are to read three of the texts before we return in August.”

This may be a direct quote from your past, spoken as a teacher handed you a list of titles that were to be covered in the next term or to expand your knowledge of topic covered in the current year. The idea was that students would have time between social engagements, sports, and general relaxation to read books.

In the planetarium community we are as aware of the school holidays as the students are, as we often see a transformation in our audience population. I know that my planetarium uses part of the June and July break for maintenance and upgrades to the systems.

With a slowdown of groups coming in to the planetarium, it is also a good time to write new presentations and read some items on my reading list.

After giving many of you flashbacks to school days, I should give you a moment or two to recover.

Ready? A difference in school and professional reading lists is that the professional will have a little less Chaucer and Lord Byron and a lot more on a focused theme. Our planetarium professionals’ reading list will be focused on engaging disenfranchised learners. These learners will be the first to ask “why are we learning this,” or “how am I going to use this in my life?” The list I put together is mix of methods that can be applied at the building, classroom, and planetarium level.

Here is my suggested reading list:

- **Activating the Desire to Learn**—Bob Sullo, Association for Supervision & Curriculum Development (ASCD), 2007. According to the author, we are all driven to fulfill five essential needs: to connect, to be competent, to make choices, to have fun, and to be safe.


- **How to Differentiate Instruction in Mixed-Ability Classrooms**—Carol Ann Tomlinson, ASCD, 2007. This book offers practical solutions that emphasize relationship building, curriculum relevance, and academic success.

- **How to Give Effective Feedback to Your Students**—Susan M. Brookhart, ASCD, 2008. General guidelines for good feedback; readers will learn what kinds of feedback work best in the various content areas and how to adjust feedback for different kinds of learners, including successful students, struggling students, and language learners.

- **Never Work Harder Than Your Students**—Robyn R. Jackson, ASCD, 2009. Develop questions that lead to deeper understanding, motivation, and ownership of learning. Anticipate misconceptions, use effective feedback with the audience and organize your knowledge to create meaningful patterns in the teaching approach.

- **Rigor is NOT a Four-Letter Word**—Barbara R. Blackburn, Eye On Education, 2008. Rigor is and how individual educators can provide challenging learning experiences to prepare students for a better future.

- **Taking Action on Adolescent Literacy**—Judith L. Irvin, Julie Meltzer and Melinda Dukes, ASCD, 2007. This book offers strategies to help educators integrate literacy and learning across the content areas.

I am not requiring you to read every book on the list in preparation for a pop quiz at IPS Alexandria. Instead, I was thinking that someone, an intrepid planetarian reader for example, may want to take one of these books and make a paper or poster presentation for your regional conferences. If you are at facilities that have several staff members, you may want to investigate creating PLC’s, or Professional Learning Communities. They are groups of 3 to 4 people who read the same book and meet to brainstorm or plan ways to implement changes to their programs.

If you are at a smaller planetarium but have a collection of colleagues who are interested in creating a PLC, we have found that Google Docs is a good place for book group collaboration. PLC’s are normally associated with traditional education systems, but in my readings I have found that they can be adapted to work in the informal education system. To find a quick resource for you if you are interested in creating a PLC at your planetarium, check out www.sedl.org/change/issues/issues61.html.

Since I have given you a bit of homework already, I am skipping this edition’s lesson plan. Our next edition will be on the Small Angle Formula, so have your adding machine paper and black markers ready.

Class dismissed.
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For more details, contact your planetarium system vendor.
Vattenfall Planetarium eliminated its 70-mm dome film system, grew attendance, increased revenue and diversified its programming.

“We gave up films completely, and now we focus on high-quality development of our planetarium,” says Kai Santavuori, manager of the Vattenfall Planetarium at Heureka Science Center in Vantaa, Finland. Vattenfall is part of Heureka’s theatre unit, which is responsible for all the science centre’s audiovisual tasks in addition to the 135-seat planetarium’s operations, development, maintenance and programming. Santavuori’s immediate superior is Lea Tuuli, director of communication. Per-Edvin Persson is CEO.

All digital since a comprehensive renovation in 2007, Vattenfall employs a Sky-Skan digital dome video system with two Sony SXR 10 HD 4K projectors with custom lenses, LED cove lighting for its 17.5-m dome, and 5.1 digital surround sound. Heureka dismantled and sold the film projection system, an Iwerks 870 that shared the space with a Zeiss fiberoptic Universarium star projector. The dome, also made by Zeiss, and the star projector were retained and new seating was installed. Public response to the renovation was overwhelmingly positive and enabled the planetarium to open up programming and simplify operations in lucrative ways, reported Santavuori. “Before the renovation, we only had two giant screen films at a time in our program due to lack of technical space. Now we show four different planetarium films every day and, for example, a school teacher can also choose shows from the library. It is so easy now as everything is on hard disks and loading a show takes less than a minute. Also the length of planetarium shows, 25–35 minutes, has made a more flexible schedule possible. There are now more screenings and customer comments have been positive. They now have more time to visit the exhibitions.”

The change enabled Heureka to add a new entrance ticket package for exhibitions plus three planetarium films. “Before the alterations, the (planetarium) ticket sales situation was only, as it were, a side product which was taken if the subject was interesting or if it suited the visitor’s schedule. Now customers arrive inspired by the planetarium, not only the exhibitions. In my opinion, the reasons include shorter shows (children’s interest is kept up throughout the show), the enhanced thrill of the guest experience when the image covers the entire 500-square-metre dome, the versatility of our program, good marketing and sensible ticket packaging.”

Santavuori observed that the audience doesn’t necessarily perceive the difference in medium. “The audience is entranced by the image covering the entire dome and by the fact that the image is extremely sharp, crystal clear and it doesn’t flicker. As there are only a few planetariums in Finland and as for most people the word planetarium brings to mind some old fashioned way of showing stars, we decided that instead of calling our program planetarium ‘films’ we’d call them planetarium ‘shows’.”

He reported that during the first year, the planetarium saw a 20% increase in attendance. “Now as the planetarium has been in use for 2.5 years, we have been able to keep the attendance at the first year’s level.” He credits the quality of the programming paired with the shorter run times. “We have tried to listen to our customers’ and schools’ wishes as regards to the program and show schedules.”

Vattenfall’s programming has included Cosmic Collisions, Infinity Express, The Search for Life: Are We Alone?, Passport to The Universe, Kaluoka’hina, Black Holes-Journey into the Unknown and an interactive live show exploring the evening sky.

“Cosmic Collisions has been the most popular show with more than 135,000 viewers. There has not been a suitable children’s show available—one that would also suit older children—and I find this a bit of a shortcoming,” says Santavuori. He noted that most visitors during the week are schoolchildren and that families visit on weekends, so the program is
designed accordingly. Finland is a bilingual country (Finnish and Swedish) and Heureka observes a three-language policy with all exhibitions, brochures and notifications in Finnish, Swedish and English. Increasingly, they are also translating materials into Russian to serve a growing number of Russian tourists.

Vattenfall also hosts special events. “We have created live performances in accordance with the customer’s wishes. Company events have been on the increase, and as the majority of them take place after hours, they have not affected our normal operations. Income from these events has also been on the increase.” “Our future looks bright,” says Santavuori. “We have established our position as the leading planetarium in Finland. Several people working in the planetarium field abroad have visited us to look at our renovation. We will continue to invest in a high standard program. Staff training plays an important role. Training is planned and carried out together with the Sky-Skan personnel. We have started the planning of our own show production and hope to open the first during 2012.” The change was difficult in some respects but there are no regrets. “Retrospectively, it is easy to say that changing from the giant screen film technology to an up-to-date digital planetarium was the right thing to do,” says Santavuori. “When we were making the decision, as an old filmmaker the issue was difficult for me personally. Now I can say that we made the right decision and at the right time.”

**Bugs! and leveraging resources**

One of the big successes in the giant screen film sector is Bugs! A Rainforest Adventure. This 2003 release, produced in stereoscopic 3D by Principal Large Format and executive produced and distributed by SK Films, had a long and productive main release in 70mm giant screen formats (2D flatscreen, 2D dome and 3D flatscreen) and has been finding its way to ancillary successes in other formats, demonstrating the typically long shelf life enjoyed by the best titles in this film genre.

After studying the digital dome market (which included consulting with Paul Fraser of Blaze Digital Cinema Works), SK Films and Principal decided to invest in a high-resolution master scan for digital dome conversion. Bugs! will shortly be released in both 2D and stereo 3D for the digital dome, by arrangement with Evans & Sutherland and Sky-Skan, who will be distributing it.

Principal Large Format CEO Phil Streather calls it “sweating the asset.” He and Jonathan Barker of SK Films indicated that the lucrative exploitation of such assets is a promising direction that has only just begun. Streather had been impressed by a presentation at the 2008 conference of the Giant Screen Cinema Association (GSCA) by Jeri Panek of E&S and IMERSA co-founder Ed Lantz.

“They pointed out that a giant screen film is the best place from which to take existing material for a digital dome show. Material that originated in 1570 or 870 can be scanned from original negative at a resolution that does justice to filling the dome. Then we looked at it on a business plan level.” Their conclusion: “The digital dome represents a genuine ancillary for giant screen filmmakers.”

The proven track record of Bugs! as well as its visual quality were factors. “It’s obviously a very solid film in its genre, and it played very well in domes,” notes Barker. “We were able to make some decent business projections based on that. Not every film will necessarily make sense to incur the expense of the hi-res scan. Certainly there are a lot of giant screen films, especially 3D films, made without any expectation of ever playing in a dome.”

The rapid growth of digital dome theaters in planetariums and science centers signals an exponential and very welcome increase in the potential distribution market for creators of educational content for special venues. Added to the relatively small and finite network of Imax and other 70mm theaters, they can now also be producing with digital domes in mind.

For that reason, going forward “it is always a good idea to have a hi-res scan be part of your overall planning,” says Barker. “I advise anyone making a production for the giant screen to maximize all potential revenue streams.”

He pointed out that a hi-res scan is most economical when it is part of the initial process. The large number of digital domes tips the balance toward domes, when it comes to educational special venue formats. SK Films and Principal Large Format have this in mind as they prepare to follow Bugs! with Flight of the Butterflies. “One of the things we’ve been addressing very, very seriously is to shoot and be 100% certain this is going to work on domes. We’re thinking harder about how it is going to play on a dome now than we might have 10 years ago,” says Barker.

**Working toward standards**

Museum planner John Jacobsen, president of White Oak Associates and long an active player in the giant screen cinema industry, launched the nonprofit White Oak Institute in 2007 to look constructively at problems facing the museum field. One of their initiatives is DIGSS, which stands for Digital Immersive Giant Screen Specifications. The first step is DISCUSS (Digital Immersive Screen Colloquium for Unified Standards and Specifications), an invited conference funded by a grant from NSF, which will convene giant-screen experts and leaders to establish specifications and standards for a digital equivalent of giant-screen film exhibition.

The DIGSS team includes Christopher Reyna (founding president of the Large Format Cinema Association, now part of GSCA), Andrew Oran of Fotokem, Ed Lantz of IMERSA, Victor Becker (a specialist in theater geometry), Mark Peterson (director of theater analysis for White Oak) and Jeannie Stahil (White Oak’s expert in museum economics).

Others contributing their industry expertise to Jacobsen’s digital brain trust initiatives include Greg MacGillivray of MacGillivray Freeman Films, Mark Katz of National Geographic Cinema, Toby Mensforth of Smithsonian Enterprises, Doug King of the St Louis Science Center and James Hyder, publisher of LF Examiner. (MacGillivray, Katz, Mensforth, King and Oran are all members of the GSCA Board of Directors.)

A two-day meeting will take place at White Oak headquarters at Marblehead, Massachusetts in June. The resulting draft specification will be published online and open to commentary by all giant-screen and digital dome professionals later this year. Project principal investigator Jacobsen says, “One of the things we’ll do is look at findings on Maya Skies, the digital dome show funded by NSF. There will be a report on what our field is finding out (Continues on Page 67)

![Stills from Bugs! A Rainforest Adventure. Courtesy SK Films](https://example.com/bugs_stills.jpg)
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This column is being finalized while the Icelandic ash cloud still covers most of Europe and has closed many international airports. It is generally believed that air traffic soon will run as usual, even if the Eyafjallajökull volcano might stay active for months to come. I still plan to meet many of you at IPS’10 in Alexandria!

The International News column is dependent on contributions from IPS Affiliate Associations all over the world. Many thanks to Vadim Belov, Bart Benjamin, Ignacio Castro, Gail Chaid, Pierre Chastenay, Alexandre Cherman, Alex Delivorias, Martin George, John Hare, Nataliya Kovalenko, Linda Krouse, Shaaron Leverment, and Loris Ramponi for your contributions.

Upcoming deadlines are 1 July for Planetarian 3/2010 and 1 October for 4/2010. Anyone who wants to contribute news from parts of the world where IPS has no Association (see page 3) is welcome to send it to Martin George, International Relations Committee, at martin-george3@hotmail.com.

Association of Brazilian Planetariums

A new star shines on Brazilian soil. In March, 2010, the Belo Horizonte Planetarium opened to the public, after a long journey through time. The first project of this planetarium dates from 1992!

Belo Horizonte (Portuguese for “Beautiful Horizon”) is located in the capital city of Minas Gerais State, one of the largest and richest states in Brazil. Belo Horizonte is the third largest city in Brazil and the only capital city in the Southeast region that did not have a planetarium.

The new planetarium has a Zeiss ZKP4 projector integrated with the SpaceGate Quinto digital system. It currently is showing an original production named ABC of the Stars for grade school kids.

On a different note, the Association of Brazilian Planetarium salutes the Rio de Janeiro Planetarium’s bid proposal for IPS2014. South America is the only inhabited continent never to have hosted an IPS Conference, and hopefully this will change in 2014.

Association of Italian Planetaria

News from stars and constellations have always inspired philosophers, scientists and artists to create works that have forever enriched the heritage of humanity. Formerly there was no distinction between the figures of the scientist, artist, philosopher and mystic; the person, who “knew,” contained everything in himself.

And it was with this conviction that, at the Ignazio Danti Planetarium in Piscille-Perugia, the multimedia performance Music of Infinity was presented in February. The violinist Fabio Imbergamo led the audience into the infinity with his beautiful songs, accompanied by spectacular images of the planets of the solar system and mythological references in passages recited by Marcello Manuali.

A performance was offered where art forms such as music, the image processing and the acting have met and harmonized with science, transporting the viewer into a dimension made of space, sound and celestial bodies in inspirational surroundings, which is the planetarium.

Ignazio Danti Planetarium also hosted Planet, the 2010 national Meeting of Italian Planetarium Association, in April.

Association of Mexican Planetariums

In 2009 the International Astronomy Year had many activities for public participation, surpassing expectations. An impressive issue was the fact than 210,000 people went star gazing through thousands of telescopes spread across México and in France simultaneously.

The Star Night is an event fostered by the French Embassy in México, supported by various educational and research institutions like the National Astronomy Institute, the National Anthropology Institute (where many archeological parks remained open at night for this purpose) and the National Council for Science and Technology, among others.

This year, like last year, 10 AMPAC-member planetariums participated in the April Star Night, offering free public events where
### Astronomy groups and associations perform star observation. This kind of activities awaken public interest in astronomy and in planetariums.

### British Association of Planetariums

International Year of Biodiversity 2010 is lending its influence to many planetarium shows and presentations, with astrobiology being a stimulating hook for adults and children alike to make a more personal link with astronomy.

It is often the smaller domes, such as Explorer Dome (Bristol) or Science Dome (Oxford), who are able to be flexible to vary shows to specific schools requests – environmental issues, animal adaptation, and microbiology all being big sellers this year.

At the BAP Conference in May this year, the theme was “is there anyone out there?” Along with the UK premier of Natural Selection from Mirage 3D, the conference hosted talks for dome professionals and teachers on extra-terrestrial life; many fulldome features concentrate not on physics/astronomy but on biology and earth sciences.

A newly-forming fulldome company based at Surrey University introduced themselves at the conference with their pilot show Wake Up and Smell the Coffee. It chronicles the epic journey of caffeine from bean to brain: travel with caffeine through cell walls and into the bloodstream before finally interacting with neurons in the brain. It is a show aimed at A-level biology.

A fulldome slant to the BAP Conference was reflecting the increased use of fulldome digital projection. Many domes have been updating equipment over the past six months. For example, the planetarium of the Great North Museum in Newcastle has new projectors: three LED projectors suspended from the dome. Steve McLean said “What a difference, great resolution and colour, and nothing to block your view in the middle, so we are very excited about it.” Techniquet in Cardiff has installed a Digitalis Gamma fulldome projector, so now comes the work of converting their many in-house productions to full dome!

An open session to ascertain what planetarians and teachers look for in a planetarium fulldome show yielded some interesting results. Planetariums who have not updated equipment and who may use other methods, such as multi-sensory/hands-on/presenter led shows, still hold their own perfectly well with visitor numbers and recommendations that certainly match the domes with more advanced technologies.

Art installations in the dome are becoming more popular, proving to be a fantastic way to engage with new audiences and also to tap into new streams of revenue and funding. The Centre for Life in Newcastle, Thinktank in Birmingham and INTECH in Winchester are taking a front seat to push short fulldome art experiences and projects forward. Particularly interesting and useful is to consider what is happening and what more could be done from the mobile planetarium side.

Finally, BAP’s new website has proved its worth in the short time it has been online, attracting new members to BAP and inspiring individuals to think about setting up planetarium domes themselves. With increased traffic comes increased advertisement, which is great for the members. The professional look of the site has had a secondary effect: browsers now get in touch with BAP for professional matters such as searching for expert opinions for radio/TV interviews, examination marking and for various research projects. The fact that many large and mobile planetariums provide the facility where interested individuals can present by planetariums in Vancouver, Montreal, Calgary and Winnipeg), will also include new images from Hubble. A process of setting up an archive for more than 300,000 images from around the world amassed over the past 40 years is also underway. This begins the long process of sorting the catalogued images and eventually digitizing the gems.

MacMillan staff has been busy with outreach as well. This past year they have experimented with connecting into schools via Skype. Skype provides a very accessible alternative to other, more complex video conferencing systems and there has been great feedback from teachers. With this simple technology, the interpretive staff can bring some of the best parts of the planetarium programs into the classroom.

They are also working with the local cable company, Shaw Communications Inc., to produce astronomy and space science “shorts.” With the dynamic team of the planetarium’s public programmer and astronomer, over 60 segments on topics ranging from black holes to light sabers have been filmed. These shorts air regularly on a local television station.

In a more traditional approach to outreach, the MacMillan staff has been taking the new Digital Starlab to students all over British Columbia. The response from students and staff has been overwhelmingly positive. In addition to the great content available through Starry Night Small Dome program, they are also working on converting elements from the popular planetarium show Sky Stories: A...
First Nation’s Journey into a format for Starlab. Contact: Lisa McIntosh, lm McIntosh@spacecentre.ca.

European/Mediterranean Planetarium Association

Six months after its opening to schools, Eugenides Planetarium’s show 7 wonders of the World is still going strong and, based on the bookings received, the planetarium projects that it will continue to do so by the end of May. Thereafter, it will naturally diminish due to the beginning of the secondary education examinations.

EMPA members planning to attend IPS’10 in Alexandria includes Alex Delivorias and Manos Kitonas from Eugenides Planetarium.

Great Lakes Planetarium Association

Illinois. In April, Lakeview Museum held its 10th Interplanetary 5K Race/1 Mile Walk/Kids Fun Run through portions of Peoria’s Community Solar System model. In May, the museum’s fundraising event had an astronomy theme, a Meteor or Shower Golf Ball Drop, where thousands of numbered golf balls are dropped from a helicopter onto a target circle consisting of the sun and inner planets. Two more Wine & Cheese Under the Stars programs were held in the spring.

The William M. Staerkel Planetarium at Parkland College in Champaign re-opened in February after a month of cleaning, painting, and re-carpeting. Astro-Tec visited the facility and the dome was vacuumed and repainted to reduce reflectance. They also installed a new cove trough. At the same time, the college gave the planetarium a new paint job for their offices, as well as new carpet for the offices and dome. In January, the college’s Board of Trustees approved a bid for a fulldome system and new audio system. Digistar 4 will be coming to Staerkel this summer!

The Elgin School District U-46 Observatory celebrated its 100th birthday this winter with a series of public programs. In February, they hosted an open house at the observatory. Historic artifacts were also displayed at the school district headquarters. The nearby Elgin Area Historical Society also reopened its Old Main museum, which includes an exhibit about the observatory.

The Cernan Earth and Space Center of Triton College, River Grove, will soon be receiving a new three-screen video system from East Coast Control Systems that will begin the process of replacing its slide-based programming with digital counterparts. Installation and training take place in late-spring and summer.

Indiana. The Koch Planetarium at the Evansville Museum of Arts, History and Science has launched a public campaign to raise money for a facility renovation and expansion. Included in the expansion are a 2-1/2 story glass entrance, classrooms, a gift shop, meeting spaces, a new science center, and a new planetarium. Since announcing its plans a year ago, the museum has raised $13 million in pledges and gifts toward a goal of $17.5 million.

The E.C. Schouweiler Memorial Planetarium at the University of Saint Francis, Fort Wayne, will soon be receiving new planetarium control capabilities from Indianapolis-based Bowen Technovation. In February, the university dedicated the new atrium as the Robert G. “Bob” Stoeckley Atrium, in memory of the planetarium’s first director, who served from 1972 through 1986 and continued as producer and consultant to directors until 2000.

Michigan. At the Longway Planetarium in Flint, a second year of Poetry Under the Stars continued in March and April. Also continuing during this time were rock laser shows and monthly public star parties. Their annual fundraiser After Hours Under the Stars was held in April.

Currently the Kalamazoo Valley Museum Planetarium is running Sky Legends of the Three Fires as its family show. The KVM hosted an informal interstitial meeting of Michigan planetarians in February.

In March, the Peter F. Hurst Planetarium in Jackson hosted a showing of The Explorers of Polynesia in support of Jackson County’s “Big Read” of the book The Wizard of Earthsea: A Tour of the Spring Sky was presented in support of the Ella Sharp Museum’s Sugar and Shearing Day. In November, the Peter Hurst Planetarium unveiled two large prints of the multi-wavelength galaxy in the lobby, followed by a planetarium presentation and a reception featuring two decorated cakes, one of which was made into a 3-D planetarium.

The Dassault Systèmes Planetarium in Detroit opened their adaptation of the Clark Planetarium show Black Holes. Work is also proceeding on Sunstruck, a NASA grant show for traditional and fulldome theaters exploring the sun and the Solar Dynamics Observatory. The Detroit Children’s Museum will re-open under the management of the Detroit Science Center in June, including its Spitz planetarium.

At Battle Creek’s Kingman Museum, the winter season kicked off with its own program, Out of this World Space Adventure. Over the course of three half-days, the children made solar system models, watched planetarium shows, and learned about the constellations.

The Roger B. Chaffee Planetarium in Grand Rapids has spent the winter occupied with a major reimagining of its lower elementary show Crickets and Constellations in preparation for daily presentation during the Grand Rapids Public Museum’s exhibit titled Big, Big Bugs. Their staff recently hosted an in-service day for their local community college.

Marquette’s Shiras Planetarium ran a mix of show topics this spring, including a greater emphasis on observational astronomy using their MS-8 opto-mechanical star projector and live sky shows.

Ohio. Shawnee State University’s Clark Planetarium recently installed Hubblesource’s ViewSpace.

The Erie Planetarium (Pennsylvania) recently celebrated its 50th anniversary! The planetarium started out with a Spitz A2 and then eventually upgraded to a Spitz A3. Jim Gavio ran a series of sold-out Dinner under the Stars programs for Valentine’s Day this year.

Gene Zajac, Bryan Child, and Joe Marenzick from the Shaker Heights Planetarium recently attended the Solar System Exploration Educator’s Conference in Houston. Gene met Alvin Drew, who flew on Shuttle Mission 118 and will fly on the final mission, 133. For their recent public shows, Gene and six of his students did a joint venture with the Shaker Lakes Nature Center.
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Besides running the Bowling Green State University Planetarium, Director Dale Smith is teaching an honors introductory astronomy course, a senior/graduate course on stellar structure and evolution, and a quiz section of introductory physics.

The activity is on the outside at the Ward Beecher Planetarium at Youngstown State University. Construction has begun on a sundial memorial to honor the late Richard Pirko, long-time planetarium technician, who passed away in 2008. Former Planetarium Director Warren Young is one of the principal backers of the project.

**Wisconsin and Minnesota.** The Minnesota State University-Moorhead Planetarium recently hosted an observing event called Saturn: Lord of the Rings with their local astronomy club.

The UW-Milwaukee Manfred Olson Planetarium celebrated spring with the programs *Life of a Star* and *Shooting Stars*. They also hosted a *Stars in the Tropics* benefit event in April.

This spring, the Blocher Planetarium at the University of Wisconsin-Steven’s Point presented *Sky Quest, In Search of New Worlds* and *Marquesq*.

**Nordic Planetarium Association**

November 2009 saw the premier of the Stockholm, Sweden Cosmonova’s first production with their new fulldome video system: a live ambient electronic music concert with the group Carbon Based Lifeforms (CBL), who are based in Göteborg, Sweden. The 45-minute long event was produced by Tom Callen, Cosmonova’s astronomer/program producer using SCISS’s Uniview, Adobe AfterEffects and Photoshop. Two concerts were given on two dates in November; the first sold out and the second just short of selling out. Judging from the audience’s reaction on both nights, it was much appreciated by both CBL fans and the general public. One of the goals, encouraging a different kind of audience to attend Cosmonova’s regular public shows, seems to have been met.

Unfortunately, bad news at the start of 2010 has followed the good news at the end of 2009. Due to financial problems at the Swedish Museum of Natural History, Cosmonova’s parent organization, 11 people were told that they were going to be laid off from their jobs starting 1 March. One of those was Tom Callen, who had been in the Museum staff for over 18 years.

According to Stockholm newspaper articles, the museum intends to no longer produce original planetarium shows with their new equipment, but rather just offer pre-produced “push button” shows made elsewhere that have had their soundtracks versioned from English to Swedish.

Callen joined the what was then Stockholm Omnitheater Project in September 1991 and was involved with finishing, commissioning and opening the now-named Cosmonova. Besides being astronomer and program producer, he also served as their Digistar i systems manager and programmer until that system was removed to make way for fulldome video that premiered in 2008. Much of the Request for Proposals for the new digital 3D and fulldome systems were written by him based on doing RFP work as part of his previous job of 13 years at the Albert Einstein Planetarium of the Smithsonian Institution’s National Air and Space Museum.

Callen has also written and illustrated an original monthly astronomy article on-line since 2002 as well as Cosmonova’s space- and astronomy-based web pages.

The Lund Observatory Planetarium that closed down two years ago has recently reopened as part of the Lund Vattenhallen Science Center. Regular shows will be given for school groups and it will be open to the general public from time to time. The planetarium will be run by staff from Lund Observatory and it is planned to upgrade the equipment over the coming year. The planetarium are Anna Arnadottir, PhD student, and David Hobbs, researcher. The web page is www.astro.lu.se/Planetarium.

The science center Backyard Cosmos in Vämnhus, Sweden has a planetarium with a 5-m dome. There, Europe’s first Warped Media all-sky video was installed in February by Mark Perkins from Ash Enterprises and planetarium director Per Broman. See also www.backgard.se and www.planetarium.se.

**Pacific Planetarium Association**

From Lawrence Hall of Science in Berkeley, California, Alan Gould and Toshi Komatsu report progress on the new and improved William K. Holt Planetarium.

Early planetarium staff gathered to celebrate at the 40th Anniversary Gala. They were Andrew Fraknoi, Dennis Schatz, Cary Sneider, Budd Wentz, Alan Friedman, and Alan Gould, who celebrated at the old dome. Since then research and preparations have been underway to prepare for a new dome, projector, and seating.

The problem with the old planetarium after the fire marshal requirement that three seats be removed was that it could not accommodate at least 30 people or a normal school group. Groups had to be split into two groups. The entrance was also not wheelchair accessible.

After research and narrowing down the field of acceptable projectors, a “shootout” was presented at a meeting of the Bay Area Domes subgroup of the Pacific Planetarium Association. The Digitarium Epsilon projector was selected. Pacific Domes was chosen to create the 30-foot geodesic dome. The sound system was designed by Pro-Home Systems.

The old Goto Mercury Projector is now part of the Planetarium Projector Museum near Bog Bear, California, www.planetariummuseum.org.

Lawrence Hall of Science has produced many great audience participation programs for planetariums called PASS; see lawrencehallofscience.org/pass.

Alan Gould and Edna DeVore, who have been involved with the Kepler mission education-public outreach effort, reported a newly-designed Kepler website (kepler.nasa.gov). They also attended the American Astronomical Society meeting, where first Kepler planet discoveries were announced 4 January 2010.

Bing Quock, assistant director of the Morrison Planetarium, San Francisco, reports that Carl Zeiss, Inc was in town for a technology demonstration featuring their Velvet high contrast fulldome display system. The American Museum of Natural History production of *Journey to the Stars* was presented. For more information, contact Bing Quock, bquock@calacademy.org.

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vada, North Las Vegas, organized their annual teacher workshop. The teachers spent three days in the planetarium and/or the classroom.

Edna DeVore from the SETI Institute educated the 30 classroom teachers from the Clark County School District about the Kepler Project.

On another day the teachers trained on the Library of Congress Primary Sources web site (memory.loc.gov/ammem) to research the Wright Brothers and the History of Flight. Another day, the teachers worked with Brian Hawkins, an aerospace education expert from NASA Ames Research Center.

PPA President Benjamin Mendelsohn reminds PPA members about the Western Alliance 2010 Conference 4-7 August 2010 at King Science and Technology Magnet’s Planetarium in Omaha, Nebraska.

The WAC for 2011 will be at Central Texas College, hosted by Mayborn Planetarium in Killeen, Texas. And of course, PPA members won’t forget the upcoming exciting IPS Conference in Alexandria, Egypt.

Russian Planetarium Association

The Conference of the Russian Planetarium Association was in March 2010 at the Planetarium of the Cultural Center of the Russian Army in Moscow. The conference was attended by 47 lecturers and educators from 24 Russian and 1 Kazakh (Athyve) planetariums.


The conference attendees made a trip to Kaluga to visit the Museum of Cosmonautics History there. New digital fulldome shows and the optical projector SKYMASTER ZKP 4 put into operation in 2009 were demonstrated to the visitors.

The conference summarized the results of activities during the International Year of Astronomy (IYA2009). The most active IYA2009 organizers and participants were awarded with diplomas of the Astronomical Society. This was the last meeting of the Russian planetarian community attended by the most senior lecturer of the Moscow Planetarium, Stanislav Shirokov who died on 18 March 2010.

Zinaida Sitkova, chairman of Board of the Russian Planetarium Association, informed the participants about the Russian Cosmonautics Year (2011), announced by President of the Russian Federation Dmitry Medvedev in commemoration of the 50th anniversary of the cosmic flight by Yuri Gagarin.

The traditional annual extramural astrocospic contest for schoolchildren of the city and region was launched in February by the Nizhny Novgorod Planetarium. This year the contest is dedicated to the memory of the Noble Prize Winner Acad. Vitaly Ginzburg, who held the position of professor at the Lobachevsky State University of Nizhny Novgorod 1945-1968.

The sounds of a celtic harp under the digital stellar heaven of Nizhny Novgorod Planetarium pleased visitors in February during concerts by the Hungarian musician Alizbar.

The Annual Spring Astronomical Conference, traditionally timed to the equinox, was held in March at the Nizhny Novgorod Planetarium. The conference program was quite extensive and included a report on dwarf stellar objects, a review of the March stellar sky, and the information on the project “Planetarium to Schools.” The new show Hypatia Inheritresses was also presented. The educator section of the conference was devoted to teaching astronomy in the school physics courses, experiencing the delivery of astronomical open classes, and sharing multimedia material used for astronomy teaching.

A variety of events were offered to the public at the Barnaul Planetarium on the International Day of Planetaria. The Festival of Planetarium Lectures and Shows were prepared at Perm, Vladimir, Nizhny Novgorod, Kaluga, and Kostroma planetariums. In addition, the visitors could enjoy the best works by the participants of the contest “All stars to the Planetarium.” The contest included several nominations, such as spacecraft models, architectural models for future planetariums, presentations of research projects, pieces of art, scenarios, and poems. More than 950 adults and children of the age over 7 participated.

Southeastern Planetarium Association

For the past several years, the SEPA Council has worked to set up a scholarship fund to assist travel to conferences, funded through proceeds from the annual silent auction at conferences and donations from members.

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SEPA President-Elect April Whitt chaired the scholarship committee, whose job it was to develop an application process and then award scholarships for the 2010 SEPA conference in Bays Mountain, Tennessee. It is expected that the scholarship program will continue and hopefully expand in future years. The following is paraphrased from Whitt’s report to Council:

It was decided to award up to six scholarships of $250 each for the 2010 conference. Future years may vary. Each scholarship will cover the amount of registration and, depending on how the costs work out, perhaps a small stipend for travel or hotel stay.

To apply, one must be currently employed at an active planetarium (i.e., be a member of the planetarium staff) in the SEPA region. Candidates must submit a completed scholarship application and current resume. Applicants must meet deadlines for submitting the application and, if selected, must meet deadlines for conference registration and paper presentation.

Scholarship recipients must present a paper or poster at the conference. The paper or a write-up of the poster will appear in the fall edition of the SEPA journal. Recipients of the scholarship this year will be ineligible for the award the following year.

Candidates must complete an on-line application form found at the SEPA website; the deadline is approximately five months prior to the upcoming conference. Successful applicants are notified by e-mail at least 90 days prior to the conference.

The conference site for 2011 will be the Rollins Planetarium at Young Harris College in Young Harris, Georgia. The conference center and hotel will be the elegant and nearby Brasstown Resort. Young Harris is nestled in the picturesque high-mountain region of extreme north Georgia. Look for details in this column in a future issue of the Planetarian.

For more information about SEPA, please visit the website sepadomes.org.

Southwestern Association of Planetariums

The first planetarium in a children’s museum opened in 1949 at the Fort Worth Children’s Museum in Fort Worth, Texas. It was an oblate spheroid, 18 feet in diameter, constructed of plywood and cardboard under a tent in the museum’s backyard. It was in this setting that a Spitz A-1 was installed amid the steel folding chairs. When the Museum moved to a new building, the Spitz A-1 was installed under a spherical 30-ft plaster dome. Indeed, this is the planetarium in Fort Worth.

In 1955, this planetarium was dedicated to Miss Charlie Mary Noble, a local teacher of mathematics, and became the first planetarium in the world to be named for a woman. Several years later, a new Spitz A-3 star ball was installed, used by the planetarium until the building was razed in 2007.

In November 2009, the new Fort Worth Museum of Science and History opened its doors, together with the new Noble Planetarium. Planetarium consultants Visual Acuity guided planetarium staff effortlessly through this complicated construction process.

The planetarium experience starts even before guests enter the dome. The dim lighting and the quiet of the exhibit hall prepares guests for the out-of-the-world journey they are about to embark on. One wall is covered by Dr. Axel Mellinger’s new view of the Milky Way. The center of the room spotlights a 302-pound oriented pallasite, on loan from the Brenham Meteorite Company and Phil Manni. “We are particularly pleased to display this meteorite, because we assisted in its recovery,” says Linda Krouse, Noble Planetarium Director. Other meteorites owned by the museum are also on display, including the 100-pound Blue Mound nickel-iron specimen, which fell in 1964 to the north of Fort Worth.

Also in the exhibit hall, an astronaut with a Manned Maneuvering Unit hovers above your head, as does one of the original Sputnik satellites from the mid-1950s.

Four large video screens dominate another wall, together with a large display of the electromagnetic spectrum. The screens display current images of the sun in various wavelengths with commentary about today’s views. Currently the solar images come from the Solar Heliospheric Observatory, but soon the Noble will be showing its own images. Partnering with the University of North Texas in Denton, Texas, the Noble is currently building a solar observatory at the university’s remote site, housing a Chronos mount and four solar telescopes with cameras. White light, hydrogen-alpha, calcium-K, and sodium filtered images will be microwaved to the university and to the Noble Planetarium for use with astronomy groups and classes.

The Noble Planetarium itself is a new Astrotec 12-m (40-ft) dome. The “kneewall” is 10.8 m (36 ft) diameter, allowing 60 cm (2 ft) all around for additional projection and future expansion. At the center of the room is Zeiss’ ZKP4 fiber optic star ball, providing a beautiful night sky. Surrounding the star ball are five Zeiss Spacegate projectors to providing all-dome digital images. This hybrid system, along with SCISS’ Unview software, provides the best of both worlds. The bonus is that one is never without a way to provide programming.

A local steel fabricator worked with Noble staff to provide a new version of circular seats, which are removable to allow flexibility for the room. Recently, the Noble provided 60 people dinner under the stars with tables and
It Takes Two

It takes two video projectors... no more and no less, to create the world’s best HYBRID planetarium skies. While other manufacturers may use 5 or even 12(!) lower-resolution video projectors, GOTO INC uses two high-resolution projectors with custom-designed GOTO-manufactured lenses to give superior results.

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Two JVC SH4K video projectors with custom GOTO lenses combine more than 13 million pixels with the CHIRON opto-mechanical sky in Fujisawa, Japan.

The opto-mechanical star projector in a planetarium must be at the center of the dome’s curvature to do its job accurately. But if video projectors are mounted along the dome’s perimeter, they cast a shadow of the star projector on the opposite side of the dome. Other companies try to avoid that by using 5 or more video projectors, scattered around the room. GOTO thinks that’s not the way to go.

GOTO HYBRID Planetariums™ use twin, high-resolution video projectors mounted very close to the opto-mechanical projector, and use special, very wide-angle lenses to overlap above the star machine. The result is a full, shadowless image on the dome, blended along a single line.

Others who use 5 or more projectors, suffer 8 or more blend lines in their images, which can lead to visible seams interrupting the image unless absolutely ALL of the projectors are precisely matched. So their users spend time frequently readjusting the video projectors. Instead, see a GOTO HYBRID Planetarium™ in action and you’ll agree: **It Takes Two.**

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chairs brought in for the event.

In addition to purchased programs, the Noble produces many shows in a recently upgraded small production studio. With the addition of two Canon 5D Mark II cameras, a new RED 4k x 4k video camera, and multiple fisheye lenses, as well as a small render farm, they are able to provide programming that is specific to local needs. Don Garland, assistant director, runs the studio and is production manager. Programming is an equal mixture of purchased shows and live shows to provide variety for audiences, as well as the capability to provide new information about space as events occur. Planetarium Educator Rachel Thompson and her staff of 10 volunteers and part-timers greet each guest and answer questions, as well as narrate the live shows.

While under construction, the Noble purchased two portable domes from e-Planetarium. Outreach Educator Sarah Littler takes planetarium programming to schools and science events across Texas and adjoining states. The programming for the mobile Noble is also done in their own studio.

Other activities include monthly star parties with the Fort Worth Astronomical Society, telescope building classes, and distance learning sessions.

The Noble Planetarium hosts approximately 125,000 visitors per year, which includes public, schools, portable dome classes, university labs, and private events. For more information, check www.fortworthmuseum.org.

**Ukrainian Planetariums Association**

The AstroDnepr Amateur Astronomy Club of Dnepropetrovsk Planetarium celebrated the closing of the IYA2009 in January 2010. The most active participants and organizers of the main events and projects in Dnepropetrovsk during IYA2009 gathered at the planetarium. In February, the presentation “how to make a telescope” by Anton Melnik, who built a 150 mm reflector, was featured.

In March, the mini-conference Stellar Occultations by Asteroids in Dnepropetrovsk, March 2010. From the left to the right are Alexandr Prokofiev, AstroDnepr, Dnepropetrovsk; Vladimir Slusarenko, Astroclub of Lyceum #59, Kiev; Nataliya Virnina, Astrodes Club, Odessa; Roman Kostenko, Poltava Society of Amateur Astronomers POLA, Poltava; and Oleg Krykya, Krasnograd. Courtesy of Dnepropetrovsk Planetarium. (Next) Hans-Georg Schmidt from Munich Public Observatory makes a presentation for Dnepropetrovsk Astroclub AstroDnepr to Alexandr Prokofiev, March 2010. Courtesy of Dnepropetrovsk Planetarium. (Next) Visitors of the scientific-popular astronomy exhibition “The Universe at the Very Heart of the City” in Kyiv Planetarium. Courtesy of Kyiv Planetarium. (Bottom) Organizers and high guests at the opening ceremony of scientific-popular astronomy exhibition “The Universe at the Very Heart of the City” in Kyiv Planetarium, also March 2010. Iрина Vavilova from Main Astronomical Observatory of NAS of Ukraine, who was the coordinator of the IYA2009 activities in Ukraine, gives short talk. Courtesy of Kyiv Planetarium.

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the Life of a Genius, What are we Looking for in Cosmos?, and 50 Years-Is it Much or Little? (about the Kherson planetarium).

In a framework of jubilatory events, together with the Center of the Youth initiatives, the project World of Stars in the World of People has been prepared. It was performed on the evening of 15 May 2010 and project included a master class on the construction of kites, theatrical mono performance, sidewalk astronomy, and the youth action “Keep the planet, you are not alone.”

In Kiev Planetarium, the closing ceremony of IYA2009 took place in March. The official ceremony gathered scientists, top Ukrainian astronomy officials, astronomy communicators, and students. Talks were given on results of Ukrainian activities during the IYA, including one presented by Irina Vavilova, coordinator of IYA in Ukraine. The same talk was given at the International conference in Padua that closed IYA2009. Scientists and astronomy officials delivered talks on actual questions and discoveries in astronomy, describing the situation with astronomy in Ukraine. Astronomy communicators received praise for their work.

During the week after International Day of Planetaria, Kyiv Planetarium hosted the scientific-popular astronomy exhibition “The Universe at the Very Heart of the City.” The international cultural association The New Acropolis prepared and presented posters with astronomical pictures, describing objects of the solar system, the galaxy, and the universe; informational posters on outstanding astronomers; and those describing constellations and celestial myths. After being showed in the planetarium, the exhibition was displayed at New Acropolis House in Kiev for two more weeks.

It has been some time now since I mentioned to you Chris’ proposal for a planetarium in Gaza. I am hoping that this project will eventually succeed, but meanwhile there has also been some progress in the proposal for a portable planetarium in Arbil Province in northern Iraq. We have learned that the governor of the province is keen on such projects, and it is hoped that funds may be made available.

I’m delighted to report that Chris feels very positive about this initiative and I hope that by the time of the IPS in Alexandria we shall have some more to report.

It is very timely that IPS 2010 is being held in Egypt, because of the current initiative to set up an IPS affiliate for the Arab-speaking world. Marc Rouleau has devoted a great deal of time to working on this, and by the time you read this I am hoping that an initial meeting of planetarians in the United Arab Emirates will have been held.

Following this, an important part of the IPS conference will be an Arab-Speaking Planetarium Meeting on 26 June. I recently had a long and productive telephone conversation with Marc on this and all of the related issues, and I and the rest of the committee feel that this meeting, which I and hopefully one or more other members of the committee shall also be attending, will be a valuable one.

As you will all be aware, the committee had been hoping to produce translations of abstracts for IPS2010. After discussion with Omar, it appears that the timing of the arrivals of abstracts will be a little too tight for this to happen in advance of IPS2010. We must, of course, remain aware that the official IPS language is English, but we still hope to be able to produce some abstract translations afterwards, in order to at least have a record, in several other languages, of the type of material covered by the conference. In particular, Guo Xia in Beijing is still happy to make some Chinese translations available to our Chinese colleagues.

During late January and early February, I traveled to India to, amongst other things, pay a visit to our planetarium colleagues in Delhi and Mumbai. (See article on Page 36). I am pleased to report that my discussions with Rathnasree Nandivada in Delhi and Piyush Pandey in Mumbai were very productive and I am very grateful to them both for spending some time with me. The main push there at the moment is to formalize and consolidate the Indian planetarium group, and I think we are well on the way to achieving that aim. I have suggested that a newsletter circulated amongst planetarians in that country will have a unifying effect and look forward to contributing one or more short articles to them soon on behalf of the Committee.

I look forward to seeing you at IPS2010!
As I write this column, the Norrköping Visualization Center is preparing to open to the public on May 27. The center will host a dome theatre, exhibition halls, cinemas, research facilities and conference arenas. The center creates a platform for public activities as well as research and production centering around the area of visualization. For more information about the center, please visit their website: www.visualiseringscenter.se.

Katarina Przybyl, production manager, wrote to say, “We bought the GeoDome in the fall 2008, after having brought it to Norrköping to a New Media festival and a local cultural activity. The aim was to introduce the dome medium to our future visitors, staff, collaborators and local production teams and artists, which was very successful.

“During the same time we had just started a close collaboration with the Centre for Climate Science and Policy Research (CSPR) with the goal to produce a climate-change-oriented, Uniview-based live presentation to our upcoming dome facility. The CSPR saw new possibilities arising with a mobile dome. It would give us the possibility to do presentations in schools, at national events and, not the least, at the big upcoming climate meeting, COP 15.”

“The Climate Change project, called World View, has grown ever since and resulted in several conferences, international and national presentations, generating funding for further climate visualization research and a large media attention.

“There is more information about the project at www.visualiseringscenter.se.”

Anna Öst, project leader from Norrköping Visualization Center and Tina Neset, head of Visualization, CSPR, continued: “Like Katarina wrote earlier we started using the GeoDome to both promote the dome medium in our region as well as using it for production tests and climate shows together with the Centre for Climate Science and Policy Research at the Linköping University.

“This project emphasizes the exploration and development of narrative and alternate forms of presentation that provide tools and inspiration for taking initiative toward a positive future development. This demands the initiation of new approaches and methods for conveying knowledge to a young audience, where participation and interaction are essential ingredients. From the beginning the aim was to find new ways of visualizing climate change and climate research data and exploring the possibilities with using immersive environments as a communication platform was incorporated early on.”

“We’ve been using Uniview as the platform for the shows as we see great potential with using live, real-time presentations in the GeoDome. Especially when presenting the complex issues of climate and climate change it’s important to have an instant connection between the presenter and the audience, the relatively small space of the GeoDome is particularly suited for this. The software also allows us to talk about climate change on both a global, regional and local level, something that is important.

“Offering an immersive visual experience gives the audience new perspectives on climate change issues. For some presentations we’ve also been using a voting system where the audience themselves can take a stand on various climate related issues which has also been a good way of further involving the audience.

“The fact that it’s flexible and mobile means we’ve been able to reach many different audiences. Two major events were the Swedish Politician’s week in Almedalen and the UN Climate Change Conference in Copenhagen 2009, two highly relevant venues for the WorldView presentations. The presentations there discussed sea level rise and effort sharing principles underpinning climate adaptation and mitigation scenarios, presenting data sets from SMHI (Swedish Meteorological and Hydrological Institute) and CSPR (Centre for Climate Science and Policy Research) research, as well as a number of emission scenarios models.

“The aim has also been to create a dome presentation to be shown at the Norrköping Visualization Center once it opens in May 2010. The GeoDome has offered us a possibility to both test our production on different target groups - from high school kids to climate research professionals. The format generates interest in itself and attracts more or less all kinds of audiences. So the GeoDome also works as a marketing tool, especially in the Norrköping region, for making people aware of the Norrköping Visualization Center and the public production and programmes that will be available there.

“All larger dome presentations have been accompanied by research surveys that focus on visualization and the dome environment as a tool for climate communication. The results of these surveys are analyzed by researchers at the Centre for Climate Science and Policy Research (CSPR) and will be published in international scientific journals. Results point towards a high-perceived relevance of the climate visualizations, but open up to questions of selection of data and which specific parts of the narrative that connect to various audiences.

Over the next year also more specific studies on perception and knowledge are planned, applying both focus group methods and interviews with the audience.

“In the future we’d like to continue using the GeoDome to be able to reach different audiences, since it’s not bound to one place it offers great flexibility. We will continue using it for shows for various audiences and on different locations. Its one way of spreading knowledge and engaging people in one of the most important current issues as well as promoting visualization and immersive environments as great tools for communication.

“For the production we’d like to work more on integrating different types of media, like movies and animations as well as better ways of showing time resolved data. It would be a great way of making the presentation more dynamic. We also want to work more with the narrative and evolving the way in which we present and connect to different types of audiences.”
I look forward to reading about their research, especially their findings about the best content and pedagogy for effective presentations with various audiences. I hope to hear more from Katrina and Anna and include information about their grand opening in the September Planetarian.

Contact information: Anna Öst, Project Coordinator CitiLab, Norrköping Visualization Center; +46 (0)11 152019 and Karolina Przybyl, karolina.przybyl@visualiseringscenter.se; website www.visualiseringscenter.se

**Advertising on the Dome**

At a recent conference, Karrie Berglund showed me her method for holding the Digitalis banner on the dome. I have always used Velcro and I have seen stenciled logos, but this method is much more flexible. I thought it was ingenious because you can place a banner anywhere on the dome, for best visibility, no matter where the dome is situated. Magnets are used to hold the banner!

When I asked Karrie how she thought of it she replied, “I cannot take credit for the magnets idea to hold up our banner—that was a former co-worker. We use small neodymium (a.k.a. rare earth) magnets on the exterior with steel washers on the inside. To make the washers less visible, I use a bit of rubber cement to attach some of our dome fabric (gray side facing the middle of the dome, of course) to each washer. You have to be careful with neodymium magnets as they are very strong—finger pinches are a real issue due to the strong attraction between two of those magnets.”

It is worth it to have a professional sign company make your banner. A simple method is to use a durable material called “rip-stop nylon,” with rubberized logo and letters. A good size is 1.5 m x 1.5 m (5 ft x 5 ft). Rip-stop nylon is light weight and does not seriously wrinkle, no matter what you do to it.

**Value Your Tools**

Many people ask for advice about what kind of projection system to buy for their new or updated dome. A posting on the Fulldome Video Discussion Group prompted me to address this question again.

Two people graciously agreed to let me publish their comments about the major projection options. Please find below some comments from our colleagues, Steve Russo and Karrie Berglund.

**What do I value about an optical-mechanical star machine?**

Steve shares his thoughts:

“Primarily, the star field. The main purpose of any planetarium is to reproduce the sky as realistically as possible. Only O-M star projectors can do that. Today’s O-M star projectors show pinpoint stars, magnitudes that are realistic, and colors that match up to the real star color.

“Motions: O-M star projectors have smooth motions that are not ‘jerky’ and do not show the stars ‘trailing’ and blurring with their motions.

“Reliability: O-M star machines are reliable and have much less ‘downtime.’ If an O-M star machine has a ‘glitch,’ it can be restarted in most cases in a few minutes.

“Lifespan: O-M projectors have a life span of 30-50 years before any major upgrades or replacement. There are hundreds of O-M star machines purchased in the 1960’s that are still running 40 years later, and some that were purchased in the 1950’s that are still running!

“Maintenance. Maintenance is easier and less expensive on O-M star projectors.”

(Steven LJ Russo, Suits-Bueche Planetarium, Schenectady, New York 12308; email russo@schenectadymuseum.org; www.schenectadymuseum.org)

**What do I value about a digital machine?**

Karrie states, “Since I’m a vendor, I’ll address primarily what our customers value.

“Usability without sacrificing functionality: Our customers greatly appreciate the ease of use offered by our remote control. The remote makes it easy to present live, interactive lessons, as well as to play back scripted segments/shows/fulldome movies.

“Software support: We maintain all the software on our systems, and software updates are free for the life of the system. Because we make sure all the system software works correctly together before releasing an update, there are no compatibility issues. Obviously this saves our customers a lot of time and headaches.

“Affordability/value: Although our systems are not the least expensive on the market, we believe they are the best value, due to the above factors as well as their projection quality.

“I do occasionally have the opportunity to do public shows. I come from a background of only live, interactive planetarium lessons (Pacific Science Center in Seattle). I’ve actually never just played a fulldome movie for an audience, although I have interspersed short videos and images into my lessons. I’ve only used our digital systems with audiences since leaving Pacific Science Center.

“I’ve noticed that audiences of all ages LOVE zooming in on an object. Deep space objects, the moon, Jupiter, etc., all elicit oohs and ahs. Even teenagers, whom I consider the hardest to please of all audiences, lose themselves in the moment, particularly during the very first zoom.

“Most audiences also enjoy constellation legends with the artwork projected. Leaving Earth is also a hit, as is the ability to simulate the sky from any point on Earth or on different dates/times.

“As an educator, I think the ability to use the planetarium software to approach a concept from several different angles is the most valuable strength of a digital system. For example, when I’m discussing moon phases, I show the moon phasing as it travels across the sky, then zoom in on the moon and jump forward day by day to show the cycle of phases. However, I also take people to the surface of the moon and show Earth phases as seen from there. I don’t know how many times I’ve had people comment that they’ve never stopped to think how the earth would look if we were watching it from the moon.”

(Karrie Berglund, Digitalis Education Solutions, Inc.; karrie@DigitalisEducation.com; http://DigitalisEducation.com)

**Signing Off**

That about covers it for this column. All comments, stories, and questions welcome! Don’t forget to check the IPS Calendar for application deadlines for a trip to Italy.
the word you’re looking for is “wow”

If you haven’t taken a close look at Spitz NanoSeam domes, then it’s time you did. NanoSeam is engineered to be the finest, most seamless dome screen in the world. Because there are no overlapping panels, the screen is perfectly uniform - even the rivets are flush with the dome surface. NanoSeam, combined with Spitz’ durable powder-coat finish, is the perfect dome for demanding display applications. That’s why NanoSeam is the choice of discriminating customers like The California Academy of Sciences and Yale University. Contact Spitz to learn more about the world’s leading projection domes.
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Astronomy is to history, mythology, and general education astronomy courses is how integration throughout the show: the grandfather back and forth between these streams of narrative. The story transitions around a campfire. The grandfather explains grandfather discussing the stars while seated around a campfire. The grandfather explains the names and locations of different constellations may not seem initially compelling to them, but (I like to think) they eventually come to realize that understanding these names and stories will put them in continuity with thousands of years of history and tradition. Ideally they begin to see this backdrop of cultural tradition as a setting for the developments in modern science.

I think this is one of the compelling aspects of astronomy, and it is this juxtaposition between the old and the new that the show Astronomy, produced by White Tower Media, attempts to capture.

Astronomy begins with a boy and his grandfather discussing the stars while seated around a campfire. The grandfather explains the stories behind various constellations, and after each explanation the narration shifts to a computer voice outlining different celestial objects that have been discovered within those constellations. The story transitions back and forth between these streams of narrative throughout the show: the grandfather pointing out constellations visible in the autumn sky of the Northern Hemisphere, and the computer voice highlighting various astronomical bodies including black holes, planetary nebulae, variable stars, star clusters, galaxies, and globular clusters.

The visualization and art in this show—both mythological and astronomical—is extremely well done. The highlight of the show is the depiction of Perseus’ rescue of Andromeda using the head of Medusa. This well-rendered clip almost made me wish the entire show focused on Perseus’ adventures, and it will certainly pique the interest of audience members in learning more about the mythology.

Just as effective were the astronomy visualizations: the sequence showing Algol as an eclipsing binary, for example, was especially well done. There are also compelling visualizations of star clusters and great depictions of M15 and the Andromeda Galaxy.

The concluding discussion on the fact that the elements composing our bodies were originally created in stars is accompanied by a stunning transition that moves seamlessly from expanding galaxies to red blood cells in the body of the boy.

My primary complaint regarding the show was that I felt it tried to do too much. The science behind the astronomy presented is accurate, but there's simply almost too much of it. The transitions between the mythology outlined by the grandfather and the scientific data given by the computerized narrator seemed rather abrupt, and while the astronomy content and the mythology content were both excellent—there's an especially effective scene that depicts all the major Greek gods animated on an antique Greek urn—they didn't feel like they fit together seamlessly.

The astronomical portions, while beautifully rendered, felt like they were presenting too much information too quickly. For example, in one particular sequence the narrator explains Hubble's galaxy classification and the main portions of galaxies and then moves directly into commenting on objects like quasars, BL Lacertae objects, and Seyfert galaxies with barely a pause for breath. Throughout the show so many numbers are given relating to the distance or size of various objects (simply read with no accompanying graphical or numerical representation) that they quickly lose meaning.

What in my opinion might be a weakness to many others, however, could be viewed as strength. With regard to content, the show is a smorgasbord of information complemented by wonderful visualizations. If someone is looking for a show along those lines—general astronomy that introduces a very wide range of topics using the theme of mythology and constellations—this may be a place to start.

According to White Tower Media's website, this is slated to be the first of four shows that deal with the constellations of each season. The curious science-fiction twist at the end makes me eager to see how the rest of these shows tie into the first.
Here is something different for the solstice season, dear readers: a quarterly magazine for astronomy teachers joins the review list. The age of the Earth, the night sky and the rest of the universe complete the offerings.

We’re still looking for readers who want free books or software in exchange for sharing your opinions. Contact me at the e-mail address above.

Thanks to our reviewers for this column: Bruce Detrich, Warren Hart, Francine Jackson and Karl von Ahnen.

**The Chronologers’ Quest: Episodes in the Search for the Age of the Earth**


Reviewed by Bruce L. Dietrich, Wyomissing, Pennsylvania, USA

Human history can be viewed as a series of quests. Mankind has unsuccessfully sought the philosophers’ stone, the Holy Grail, King Arthur’s key, the lost chord, and world peace. Along the way at least one quest was fruitful. The age of the Earth has been shown to be 4.555 billion years old.

Patrick Wyse Jackson has assembled an engaging history of this search. He is a lecturer in geology and curator of the Geological Museum in Trinity College, Dublin, and is a member of the International Commission on the History of Geological Sciences. This bright knight presents a very thorough compilation of the various methodologies which have led to our present understanding.

And varied they are, starting with records written 4700 years ago, moving on to the Biblical Timetables of Archbishop Ussher and his predecessors, the development the “geological column” and oceanic salinization theories, right through to twentieth century radiographic studies on meteorites and the Earth itself. Well over one thousand years of wonder, trial and error just to discover what can be learned from a single planetarium visit! Actually, that magical datum we now share is about a half century old. And its discoverer, Clair Cameron Patterson, understood, as did Newton before him, that his insight was from standing on the shoulders of giants.

This book has 50 illustrations, seven useful tables and much charm. As Jackson thoughtfully delineates, our present knowledge base comes from recounting the myths from many traditions plus a wonderfully rich admixture of scientific disciplines. Indeed, the entire book is an homage to the generations of intelligent, dedicated heroes who mounted the earth-knowing quest.

**Our Cosmic Habitat**


Reviewed by Francine Jackson, University of Rhode Island, Bryant University, Smithfield, Rhode Island, USA

Although Martin Rees is the Astronomer Royal for Great Britain, he also apparently enjoys writing books for the general public. His Our Cosmic Habitat is a perfect example. Rather than find myself with a treatise on the universe, I found myself being treated to an easy-to-read, short, concise graphic study of meteorites and the Earth itself. Over one thousand years of wonder, trial and error just to discover what can be learned from a single planetarium visit! Actually, that magical datum we now share is about a half century old. And its discoverer, Clair Cameron Patterson, understood, as did Newton before him, that his insight was from standing on the shoulders of giants.

Everywhere in this book, the information is written as a down-to-earth lover of the subject would explain to those he is trying to bring into the fold of science. In his “Stellar Alchemy” section, the sketch of the life cycles of stars of different masses is one of the clearest visuals I’ve seen.

Don’t understand dark matter? After reading that section, which includes its first mention in the 1930s through present day, everything will be clear (although still dark).

Rees also discusses the problem of introducing a new person to an astronomical topic. “Supernovae fascinate astronomers, but only one person in 10,000 is an astronomer.” He makes sure there is adequate reason for the other 9,999 to want to learn.

As books encompassing the realm of everything in the universe (universes?) go, this one is relatively short. Its brevity, however (only 201 pages of easy-to-read print), its elaborate index (a point I find refreshing), and the fact that it was written by someone so esteemed in the astronomical community, begs the reader to ask why this couldn’t be used as a one-semester introductory text. Well-written, clear visuals, great author: a good combination for a first book on the subject.

**Night Sky: A Field Guide to the Constellations**


Reviewed by April Whitt.

Sixty-two constellations are detailed in this fine guide to stargazing. Written from a northern hemisphere perspective, the author has prepared an easy-to-follow introduction to the night sky, suitable for any reader.

The volume opens with an introduction and clear directions about how to use the guide. Otherwise the statement on page 17 that Earth “rotates” (should read “revolves”) around the Sun, the infor-
mation is accurate.

Sample pages describe two ways of using the star maps: the "map method," in which the user faces south and holds the book overhead (using the chart to find the constellation) and the "horizon graph." To use the graph, one locates the current month along the bottom of the graph, which in turn determines what direction to face and how high in the sky to look, to find the constellation.

The constellations are grouped by season. Easy-to-find star patterns are followed by constellations of increasing difficulty. Each constellation is pictured, with bright stars labeled. The constellation name, pronunciation, English name, size among the 88 official constellations, best time to look for it and some notes accompany the finding charts (overhead view and horizon graph).

The labeled stars are listed next, with distance in light years, apparent magnitude, and origin of the star's name in detail. A page of mythology/history follows. It is a concise listing.

Deep space objects are mentioned after the four seasons of constellations. A summary of planets in our solar system, and tables for locating them from now through 2019 provides an excellent reference.

Added attractions include a small red LED flashlight inside the book's back cover. The battery is recyclable, a plus for the environment. A deck of playing cards, with a different constellation on each card, provides a review session for those evenings when the outside sky is clouded out. The cards also can be purchased separately, for US $5.95.

The Classroom Astronomer

Dr. Larry Krumenaker, Hermograph Press, a division of To Teach The Stars Network, Atlanta, Georgia, USA, ISSN 2151-0105 (print version)

Reviewed by Warren Hart, Mayborn Planetarium and Space Theater, Central Texas College, Killeen, Texas, USA.

Where do you look? What resources do you consult when you are looking for new methods to teach astronomical concepts (phases of the moon, eclipses, appulses, etc.) to use in your planetarium shows? If you are like me I go to different books, look on the internet and reread back issues of Astronomy and Sky & Telescope magazines. When those resources are not enough, I then scuffle around looking for new ideas. Well, on my last foray I found a real gem.

The Classroom Astronomer is the gem. Since only three issues have been published so far (it is a quarterly), that makes this magazine a relatively new resource, and few of us are aware of its existence. However, I am sure that after becoming acquainted with it and what it offers you will consider this magazine a great resource.

In the first issue Dr. Krumenaker's editorial column clearly explains the magazine's background and purpose:

"This endeavor is an outgrowth of a research finding that classroom astronomy teachers have no publication to call their own. Articles on the practical aspects of astronomy teaching rarely appear in the larger science education magazines. The popular astronomy magazines have long since given up on covering much astronomy education, too. Thus was born the idea of this magazine, where teachers will find useful, practical how-to information, how to get astronomy concepts into the minds of students.

"I queried several dozen high school astronomy teachers about what articles they'd like and they replied: information on low cost lab for the classroom, classroom teaching techniques—lessons that work well, ideas that get a concept across, strategies, mnemonics. Also, what can be done to use the sky events for teachable moments, and more. While nominally centered on high school, teachers at elementary/middle and college are welcome in this universe, too."

When I read Dr. Krumenaker's explanation of the magazine's background and purpose, I said "This is for me!" I was especially pleased to see his request for readers to "Write for The Classroom Astronomer." We planetarians should contribute articles on teaching concepts in planetariums (and from those of us who teach also in classrooms) and our classrooms.

What I am looking forward to is this magazine has the potential to become a great central source of ideas, how-to's, etc., when we share our "sugar stick, whiz-bangers"—those presentations we do that have the kids and adults exclaiming "aha" and "wow!"

Here are some examples to pique your interest. The first issue describes "The International Astronomy Olympiad." Before you read it, guess how many times the USA has participated and how well we have done! Be sure you are sitting down when you find the answers!

The third issue has two articles devoted to the use and misuse of the predictions concerning the Mayan calendar and A.D. 2012, one written by a planetarian. The first article is "2012—The End of the World—Again?" The other article, "12 for '12"—Websites, Resources and Activities for Combating 2012 Hysteria," lists helpful and informative websites.

The basic US subscription prices (4 issues/year) at $15 per year (electronic) or $29 per year (paper edition) are great values. You can get both versions for $35 per year.

The website is classroomastronomer.toteachthestars.net. Click on the "Resources" link for access to some of the activities.

Later this year Dr. Krumenaker's book, To Teach the Stars: How to Create, Run, Maintain and Defend Astronomy in the Schools, will be available.

The Classroom Astronomer has a great future and will be a very good resource to have in your planetarium's library.


Reviewed by Karl von Ahnen, Fijitsu Planetarium, De Anza College, Cupertino, California, USA.

Upon receiving my copy of this book for review, I was truly surprised. This book is big, as well as beautiful and chock full of good information. You need an oversized book shelf for this one; it's nearly coffee table sized and, in fact, would be nice just to have sitting around to browse through.

Although there are many books available about Charles Messier's famous list, this one really stands out. First, its size and the huge number of illustrations and photographs are really eye catching. Then there's the vast amount of historical and up-to-date scientific information about the objects in the catalogue. In the first 70 pages of the book we learn about Messier's life and the making of his list, followed by an exhaustive series of tables of statistics of the objects as well as explanations of astronomical concepts involved.

The heart of the book is a sequential look at each object in the catalogue. There are three main headings for discussing each object: History, Astrophysics, and Observation.
The “History” section includes when Messier either discovered or first viewed the object, as well as historical descriptions by Messier and other early observers.

The “Astrophysics” section describes the physical characteristics such as distance, size, etc., and any recent research on the object. The “Observation” section describes what instruments, magnifications and sky conditions are needed for viewing the objects.

There are photos: some are beautiful amateur images and some are from the Hubble Space Telescope. Sketches, many by the author and many historic, help give a sense of what one might see in the eyepiece.

Charles Messier’s famous catalog is a very important to astronomers, both amateur and professional. Most of the bright deep sky objects are commonly known by their “M” number. With only a few exceptions, it is a list of all of the most beautiful deep sky objects visible through binoculars or a small telescope.

By a few exceptions, I mean that he missed a few, like the Double Cluster in Perseus and some fairly bright galaxies like NGC 253, and of course, a number of objects that were not visible to him from his latitude in Paris.

Also, there are a few objects in the catalogue that are rather boring, like M40, which is a just visual double star, or a couple of very sparse clusters. What I really like about the list, which is so revered today by so many of us as a conveniently-sized list of the sky’s greatest wonders, is that to Messier, his list was a list of “nuisance objects” that got in his way of finding comets.

This is not a field observer’s book. It is far too big to carry easily along with all your other equipment and it has no finder charts. It is a wonderful reference book and would be useful in an observatory. It is fun to read on cloudy nights. Anyone interested in astronomy will enjoy its beautiful pictures, drawings and the wealth of historical and scientific information.

(India, continued from Page 34)

(Sharing audio, continued from Page 18)

Question 13: Do you do any downmixing or speaker remapping? (For example: from 5.1 to 2.0, or from 7.1 to 5.1, etc.)

77.8% (49) answered “no,” and 22% (14) answered “yes.” Forty survey respondents skipped this question.

Question 14: Do you accept full mixes, stems, or both?

56.1% (32) accept both, 45.5% (26) accept full mixes, 5.3% (3) accept only stems. Forty-six respondents skipped this question.

Question 15: Do you provide full mixes, stems, or both?

64.3% (27) provide full mixes, 2.4% (1) provide only stems, and 33.3% (14) provide both. Sixty-one survey respondents skipped this question.

Question 16: What formats do you provide for sharing content?

44.1% (15) use 5.1 to share content. 14.7% (5) use 3.0, 8.8% (3) use 3.1, and 5.9% (2) share content using 7.1. Sixty-nine survey respondents skipped this question.

Question 17: Do you use any loudspeaker correction or equalization?

47.9% (45) answered yes, 52.1% (49) answered no. Nine survey respondents skipped this question.

References

This work was supported by Thomas Lang, Curt Hoyt, Arnaud Laborie, Andrew White, Ross Ewing, Curtis Connelly, Dan Neafus, Matt Brownell, David Malham, JoAnn Kuchera-Morin, Xavier Amatriain, Jim Kosinski II, employees at Chabot, Laura Danly, Oschin Planetarium, David Rick, and the AES Colorado Section.

Acknowledgements


Vol. 14, No. 2  
Second Quarter 1985

Comet Halley’s impending apparition dominated this issue. Von Del Chamberlain (Hansen Planetarium, Salt Lake City, Utah) had been the banquet speaker for SEPA’s 1984 conference, and his speech became the lead article. He looked at Earth as the comet would have seen it during apparitions starting in 256 B.C., the time of Eratosthenes and the early Mayans.

The fifth apparition was in the time of Ptolemy. The Bayeux Tapestry (actually a long embroidered cloth) depicts events leading up to the Norman conquest of England and the invasion itself. Isti Mirant stella: “These men wonder at the star.” In this case it is Halley’s Comet, a “star” with hair. Wikimedia Commons

The Bayeux Tapestry (actually a long embroidered cloth) depicts events leading up to the Norman conquest of England and the invasion itself. Isti Mirant stella: “These men wonder at the star.” In this case it is Halley’s Comet, a “star” with hair. Wikimedia Commons

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25 Years Ago

What’s New

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The fifth apparition was in the time of Ptolemy. The Bayeux Tapestry was inspired by the 16th, and Giotto by the 19th. Copernicus saw the 22nd return. The next was one year too early to be seen in a telescope. Edmund Halley predicted the 25th return, getting his name forever attached to the comet. The 27th return was the first to be photographed, the 28th the first to be visited by spacecraft. What will the 29th bring?

Carl Wenning (Illinois State University Planetarium) predicted that the comet would increase public awareness and interest in meteorites, and wrote on how to identify any found by the public. The advice in this article remains valid today, regardless of any passing comets or other grand attractors of public attention.

Mike Ryan (Lake County Schools Planetarium, Florida) provided suggestions on how to edit into a shorter format the widely-circulated show A Comet Called Halley. He had a running time of less than 40 minutes.

A paper presented by Dennis Jennings (of Parma, Ohio) at the 1984 IPS conference on computer music for the planetarium was expanded and updated for the Planetarian. “Always keep in mind that planetariums are an audio-visual medium, and that your soundtracks have just as much impact on your audience as does your visual presentation.” (Emphasis in the original; see related story on page 12.)

Tim W. Kuzniar (Ward Beecher Planetarium, Youngstown, Ohio) described a Halloween-themed light show done in his planetarium. This included rotating pumpkins, zoom skulls, and unveiling eyeballs. “The result was something like a cross between being in the middle of a forest and on a film set for Children of the Corn. It was so popular they had to add several extra showings. (And continues to be popular today; 2009 saw the first fulldome digital presentation.-ed)

Gary Tomlinson reviewed a book, Presenting Science to the Public (Barbara Gasteb, MD, isi Press). Planetariums should find useful sections on communicating, using A-V equipment, locating science materials, twenty questions to ask yourself when editing, and how to deal with mass media. One interesting idea: ask the reporter what they think you said!

IPS President Alan Friedman’s column dealt with how to handle comet interest and queries from the public and news media.

Regional Roundup was done by Kathleen Hedges (New Mexico). She had reports from nine regions, including Europe and Mexico. Mark Sonntag (Aldrin Planetarium, West Palm Beach, Florida) co-authored with a librarian an article on what planetarians can learn from a library, and Gerry Mallon (Methacton School District Planetarium, Norristown, Pennsylvania) showed how a planetarium can be used in secondary school classes to teach a subject such as how the eye works.

John Mosley’s Computer Corner described the primitive star charts then available for computers, and James Brown’s What’s New column found hordes of Halley-related items. The Creative Corner, run by Eric Mellenbrink, had a parallel, or double, unveiler designed by Carl Dziedziech of the Strasenburgh Planetarium, and Jane’s Corner, as usual, closed the issue with her well of humor (Mayan puppet show: Kukulcan and Ollie).

In space, three Soyuz spacecraft were launched in June 1985, and the Shuttle Discovery carried Sultan Salman Abdulaziz Al-Saud, the first Arab astronaut, into space.

The Bayeux Tapestry (actually a long embroidered cloth) depicts events leading up to the Norman conquest of England and the invasion itself. Isti Mirant stella: “These men wonder at the star.” In this case it is Halley’s Comet, a “star” with hair. Wikimedia Commons

Abdulaziz Al-Saud
Planetarians’ Calendar of Events

2010
3-5 June. ECIETE Conference (European Network of Science Centres and Museums), DASA, Dortmund, Germany. Grant opportunity for attending Pre Conference and main Conference. www.ecsite.net

8-12 June. Novice Blender Workshop at Ott Planetarium, Ogden, Utah, USA. June 15-19, 2010 - Advanced Blender Workshop. Registration is required. See weber.edu/planetarium/training for more information.

14-16 June. Japan Planetarium Society, JPA Conference Sendai Astronomical Observatory, Sendai, Miyagi. Contact Kimura Kaoru at kaoru@jsf.or.jp


2-7 July. EuroScience Open Forum (ESOF), Turin, Italy. www.euroscience.org

11 July. Total solar eclipse


4-7 August. Western Alliance Planetarium Conference (GPPA, SWAP, RMPA, PPA) will be hosted in Omaha, Nebraska, USA, by the King Middle Magnet School Planetarium. Contact: Jack Northrup, jlnorthrup@fbx.com; www.spacelaser.com/gppa

17-20 August. 7th European Meeting for Small and Portable Planetariums. Ilpo Kuusela and Arto Oksanen of the Kallio Planetaario will host this conference in Finland. Contact: ilpo.kuusela@kallio-planetaario.fi; www.kallioplanetaario.fi

2-5 October. Association of Science-Technology Centers (ASTC) Annual Conference, Bishop Museum, Honolulu, Hawaii, USA. www.astc.org

5 October. Full Dome Film Festival, Imiloa Astronomy Center of Hawaii, USA.

6 October. ASTC Post Conference Planetarium Sessions, Imiloa Astronomy Center of Hawaii. Contact: Shawn Laatsch (slaatsch@imiloahawaii.org) for more information regarding these events.

20-23 October. Great Lakes Planetarium Association Conference, University of Notre Dame, Indiana. Host will be Dr. Keith Davis at keith.davis.dvt@nd.edu. www.glpaweb.org/conference.htm

19-11 November. Association of Brazilian Planetariums meeting, Rio de Janeiro, Brazil. Contact Alex Cherman at alexandre.berman@planetario.rio.rj.gov.br

2011

April. Italian Association of Planetaria (PLANIT), XXVI National Conference, Crespano del Grappa (Treviso) and Padova, Italy, www.planetaritaliani.it. Contact osservatorio@serafinazani.it

May. Annual Conference of the British Association of Planetaria (BAP).


May. German Planetarium Association Annual Conference.

2-4 September. Nordic Planetarium Association Biennial Conference in Riga, Latvia. Conference host Dace Balode, dace@pagrabi.lv

8 September. 6th Science Centre World Congress, Cape Town, South Africa. www.astc.org

4-8 September. 6th Science Centre World Congress, Cape Town, South Africa. www.astc.org

15-18 October. Association of Science-Technology Centers (ASTC) Annual Conference, Maryland Science Center, Baltimore, USA. www.astc.org

2012
31 March. Deadline for application for scholarship funds (IPS support Baton Rouge Conference attendance by individuals). www.ips-planetarium.org

22-26 July. 21st International Planetarium Society Conference, Irene W. Pennington Planetarium, Louisiana Art & Science Museum, Baton Rouge, Louisiana, USA, jelvert@lasm.org

Yearly Deadlines for “A Week in Italy”

31 August. Deadline for “A week in Italy for a French-speaking Planetarium Operator.”

15 September 2009. “A week in Italy for an American Planetarium Operator.” For more information on the “Week in Italy,” go to: www.astrofilibresciani.it/Planetari/Wek_in_Italy/-/Week_In_Italy.htm

For corrections and new information for the Calendar of Events, please send a message to Loris Ramponi to: www.astrofilibresciani.it/Planetari/Week_in_Italy.html

For more details about several of these upcoming events is included in the International News column.

The most up-to-date information also is available online at the International Planetarian’s Calendar of Events at www.ips-planetarium.org/events/conferences.html
**Waxing New**

**John Schroer**

**Dassault Systèmes Planetarium**

**The New Detroit Science Center**

5020 John R Street
Detroit, Michigan 48202 USA

jschroer@sciencedetroit.org

+1 313-577-8400, Ext. 435

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**First, the Bad News**

With the global economy struggling to rebound, many institutions have been forced to cut back staff. Unfortunately, planetarians are feeling the effects of small budgets.

After 26 years of service, Noreen Grice—well known in the planetarium community for her work in sharing astronomy with the blind—was recently laid off from her position at the Boston Museum of Science (Boston, Massachusetts).

She will focus on her work in accessibility projects, and stands ready to assist planetarians working on grants that address accessibility issues, especially as “add on” projects to NASA or NSF grants. She has years of experience designing tactile images for books and exhibits, teaching accessible astronomy workshops, and developing accessibility solutions for programs and facilities. She can be reached via her homepage, www.youcandoastronomy.com, or by email, noreen@youcandoastronomy.com.

**And Now the Good News**

Our good news comes from Tucson, Arizona, where the Flandrau Science Center’s planetarium reopened in April after an hiatus of about ten months. Flandrau closed last June due to budget cuts at the University of Arizona. During the down period it was moved back into the College of Science, where the dean ordered that it be reopened as soon as possible.

Michael Magee, who lost his position as planetarium director last June, has been rehired as a consultant to help get the planetarium ready for reopening.

Besides reopening, the planetarium is now making plans to overhaul the theater with new fulldome equipment to augment the existing Minolta star projector.

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**In Memoriam: Charles Wilkin**

The staff at Spitz Inc. (Chadds Ford, Pennsylvania) is sorry to announce the passing of a long-time co-worker, Charlie Wilkin, 72, on March 24, 2010. Charlie worked with the Spitz family for nearly 40 years.

He installed and maintained planetariums in 46 states and 29 foreign countries, and was service manager from 1998 to 2006, at which time he retired. Many of you will remember his good-natured determination at keeping planetariums working well, his keen expertise in diagnosing instrument challenges (in later years, entirely by phone), and the stories he shared of his large, loving family at home.

Charlie was raised in Prospect Park, Pennsylvania by his grandmother, Eva Wilkin and uncle, Corry Wilkin, and graduated Interboro High School in 1957. He served in the U.S. Navy for six years as an aviation electronics technician and helicopter air rescue crewman in the HU2 squadron, and afterwards worked at Boeing-Vertol for six years before starting work with Spitz.

If anyone would like to share a memory or photo of working with Charlie, drop a note or e-mail to spitz@spitz-inc.com, and it will be passed on to his family.

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**Working With the Social Media**

The ThinkTank Planetarium in Birmingham, England, has enjoyed success with getting attention with social media such as Facebook. Here is the news from Mario DiMaggio:

ThinkTank Planetarium (Birmingham, UK) reached 1,000 Facebook fans in only 6 months (www.facebook.com/ThinktankPlanet). The interest from astronomy, space and fulldome enthusiasts has been overwhelming, and we encourage other planetariums to “go where the people are,” i.e. Facebook. Keep your fan page fresh (like a tasty sandwich), and loyal supporters will gather around you from all over the world.

You can learn more about ThinkTank’s Facebook venture by contacting Mario at mario.dimaggio@thinktank.ac.

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**In Search of Chocolate**

Aayushi Animation Studio has just introduced a new fulldome planetarium show just for the little ones: *Map to the Chocolate Planet*. It is a funny story about two alien kids who got the taste of chocolate and are now in search of an imaginary planet made up of chocolate. They travel through the Milky Way and stop at the planets of our solar system, learning lots of facts along the way. The 35-minute program is available in 3K, 2K and 1K dome masters of the show are available. 4K can also be provided on request. Regardless the dome resolution, the show has one low price: $2,690 USD, which includes domestic and international shipping.
Stanislav V. Shirokov, vice-director of science at the Moscow Planetarium, passed away on March 18, 2010.

Stanislav, who was born on November 30, 1932, entered Moscow Planetarium for the first time in 1944 when he was 12 years old. There he grasped the basics of astronomy during lessons at open astronomical classes. He brought a passion for knowledge to everything in his life.

He returned to Moscow Planetarium in 1961 to work, and passed through a career from lecturer and educator to science consultant and vice-director on science.

He always created lectures and shows for the stellar dome. He was both an idea man and the inventor of new technologies.

Stanislav always paid special attention to the open astronomy classes at the planetarium. He led the Council of Open Classes, delivered lessons, and taught children to maintain astronomical instruments and devices. He loved his pupils very much.

His inquiring mind, the ability to listen attentively and to wonder, his unquenchable thirst for knowledge, his speaking talent and his vivid perception of the world attracted boys and girls like a magnet.

The last years of his life were devoted to the reconstruction of the astronomical area of the Moscow Planetarium. This area included a collection of astronomical instruments and devices and played the role of an open-air observatory and museum.

He called this area the “Stellar Park.”

Fortunately, this child of his devotion has been born. All the show pieces of the “Stellar Park” were manufactured according to drafts by Shirokov. The unique complex of devices, instruments, and models will be presented to the planetarium visitors very soon. The “Stellar Park” by Stanislav Shirokov, his Sun City, will please and wonder us for many years until the sun ceases to rise. Thus, the memory of the eminent person, the great Russian philosopher and astronomer Stanislav Shirokov, will remain in our souls forever.

- By Moscow Planetarium staff; photo by Larisa A. Panina, March 2010

More information is available from the show distribution page, mtcp.aayushianimations.com, by emailing contact@aayushianimations.com, or by contacting Shikhar Bhatnagar, director, Aayushi Animation Studio, Nasik, India 422009, shikhar@aayushianimations.com.

Sharing the Unseen Universe

The Planetarium at the University of Texas at Arlington has introduced its third new fulldome planetarium show: The Unseen Universe—the Vision of SOFIA. This show features the science, public outreach and potential of the NASA mission SOFIA, an acronym for Stratospheric Observatory for Infrared Astronomy.

The 40-minute show discusses the properties of light, electro-magnetic spectrum, black body radiation, and infrared light as well as showing several video clips from the construction phase of the aircraft. 4K, 2K and 1K dome masters of the show are available. A pre-rendered version is also available for Evans & Sutherland theaters (Digistar3 and up). Regardless the dome resolution, the show has one price: $3,000, which includes domestic shipping.

For more information, contact: Levent Gurdemir, planetarium director, the University of Texas at Arlington, Box 19059, Arlington, Texas 76019 USA; email gurdemir@uta.edu or planetarium@uta.edu.

(Capital Cities, continued from Page 31)

- Total number of attendees: 46,428, distributed as follows: primary school students: 31,186; secondary school students: 6,135; general public: 7,627; teachers: 1,480.
- The number of sessions conducted between the months of April and September was 884.

The following list will provide an idea of the institutions that participated in this project: rural schools (some of which had just three students; others a maximum of 10), kindergartens, and special schools (schools for the deaf, mentally challenged, adult schools, and orphan homes). Among these, some were labeled as “critical context” schools, referring to children and families in a situation of social and economic deprivation.

Conclusions

Analysis of the data provided conclusive evidence that the project was highly successful and had a significant impact in each of the places visited. If we consider that, for 94% of the attendees, this was their first experience of going to a planetarium, we know that one of our main objectives—decentralizing and democratizing—was accomplished.

The feedback gathered from both teachers and students on either the contents or the proposal was extremely favorable.

The participants were not the only ones to express their satisfaction with the event. The media provided valuable support, due to the fact that every time the planetarium reached a location, it attracted attention from the local people and it was given widespread media coverage. It is important to remark that Uruguayan TV provided coverage of the project free of charge, in the belief that the program deserved such treatment in view of its cultural interest and national reach.

Finally, the most positive result came from the teachers’ evaluation of the impact of the project in their classroom: 89% said the project had an important impact, while the remaining 11% not only agreed but also provided additional feedback comments. These data allow us to project into the future and plan new and equally innovative activities to continue taking scientific and particularly astronomy-related knowledge to the different areas of our country.
Two Episodes Now Available!

Let your audiences discover the latest stories from the cosmos! With unique access to the telescopes and in cooperation with Principle Investigators, this planetarium series showcases discoveries from major international facilities.

**Episode 1: Big Mirrors on the Mountain (22 minutes)**
Voyage into Subaru, Gemini, Keck, and Canada-France-Hawai‘i observatories to explore an exo-planet, supernova, and stars orbiting at the centre of the Milky Way and galactic survey.

**Episode 2: Seeing the Invisible (22 minutes)**
Witness the James Clerk Maxwell, the Submillimeter Array, Caltech Submillimeter, and Very Long Base Array observatories to explore star forming regions, Jupiter’s atmosphere, M51, and M87.

For general audiences. Featuring stunning time-lapse footage from Maunakea and astro simulations rendered in DigitalSky 2. Available in both 3D stereo and standard 2D mono fulldome formats. Produced by Sky-Skan for Imiloa Astronomy Center of Hawai‘i. Contact Sky-Skan at +1 603-880-8500 or e-mail sales@skyskan.com. Visit SkySkan.com/shows
Jack Dunn shared an e-mail message from one of the astronomy department secretaries at New Mexico State University:

Subject line: Book

There was a moon found in the back of BX201. If you can describe it, it will be returned to you.

(And the room number was supposed to be BX102.)

Either way, it’s icky

Dr. Tim Livengood is an excellent speaker. At a conference, he described his work with comets. Polycyclic aromatic hydrocarbons or PAH form part of comets. “PAH is also known as ‘icky brown crud’ or ‘dirt,’” he said. But we call it ‘refractory minerals.’”

He also described an hour-long interview he had with National Public Radio's science reporter here in the United States, Joe Palka. They talked about comets, and comet impacts, and craters and all kinds of interesting science. But when the segment aired on the radio, it had been shortened.

“An hour-long interview was edited down to one statement: It's every little boy's dream—a big explosion!”

A comet that has broken apart (such as Shoemaker-Levy 9) could impact a body and leave a chain of craters, called a catena (pronounced kah-TAY-nuh). There’s a catena on Callisto. Hmmm, could Jupiter have pulled other comets apart in the distant past?

Speaking of Shoemaker-Levy 9, on 18 July 1994, Dr. Livengood’s team was in Chile on an observing run, and witnessed the first fragment impact. He was about to tell the whole world when a colleague pointed to his computer screen and said, “No, that’s Io.” So no one said anything to the media.

Oops—seems the colleague’s laptop was still set on Paris time. It was the comet fragment!

Losing sleep over 2012

The first entry in our 2012 Scenario Contest comes from Elizabeth Wasilik, a planetarian in West Virginia:

“After reading Elizabeth Wasilik, a planetarian in West Virginia:

“After reading your column in the March issue of the Planetarian I thought I would share the story of a physical therapist who I went to last spring when I broke my arm. When she found out that I worked in a planetarium, she said, “I have to ask you something that has troubled me for the longest time, to the point where I am not sleeping at night. Is the sun going to be sucked into the Milky Way’s center black hole in December 2012?”

“And this was a college educated person. I proceeded to draw a picture of where the sun is in relation to the Milky Way’s center black hole and how we are in no danger of falling in. I did talk a little about why black holes do not suck. It took me a while to convince her. I had to forward her pictures and maps of the Milky Way before she would believe me.”

A web comic from xkcd.com is printed here with permission from the artist.

Parting thought:

“Were I to write out one prescription designed to help alleviate at least some of the self-made miseries of mankind, it would read like this: One gentle dose of starlight to be taken each clear night just before retiring.”

--Leslie Peltier

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76 Planetarian June 2010
Dream it and we will deliver it

3D

Optical Planetarium
Digital Planetarium
Simulation Software
Production Software
Fulldome Production
Dome Screen
Study and Design
Installation
Training
Maintenance

www.rsacosmos.com
Introducing a revolutionary new way to operate your Digistar 4 system: the iPod Touch. With our new app, you can control virtually every system feature from a handheld wireless device. It has never been easier to give live astronomy presentations and respond instantly to audience questions with stunning examples on the dome. This unique interface puts the power of the universe at your fingertips.

The D4 app is also available for the new iPad!