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On the Cover: It’s not first light, but beautiful light regardless on the new Nizhny Novgorod Planetarium. Photo by Yaroslav Gubchenko; see story on page 22.
In Front of the Console

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This column is always the final step in the lengthy process of producing the Planetarian. I like to get a feel for the combination of articles and issues facing planetarians before using up my space.

The International Year of Astronomy 2009, naturally, is the major thread for this issue, the last before the year of celebration begins.

Planetariums are continuing to adopt fulldome at a steady pace, but reading between the lines, it's obvious the change is being made by those facilities able to scrape the funding together or write creative and compelling grant applications.

There were many excellent presentations at the 2008 Fulldome Summit that followed the IPS Chicago conference and we're trying to share them through the Planetarian, but I feel frustrated sometimes about the lack of pages that I can devote to them. Martin Howe's "The Future of Fulldome" is a wonderful example of the state of the field, and I apologize to him for having to cut out several sections to be able to reprint his paper. I'm sure he'll be glad to send an unedited version of his paper to anyone who'd like to read his comments about sound and interactivity in the fulldome environment.

I don't know if this is a good thing or bad, but I had to hold nearly as many articles this issue as I printed. Already waiting for their chance to appear in March are stories about teaching with Celestia; a report on "Space Confidential," the student show production project we heard about in Chicago; an update on the Clark Planetarium; Mark Petersen's "State of the Dome" report, and several more.

It is agonizing for me to decide what to print and what to hold. Sometimes it simply comes down to who submitted first.

With this issue, we welcome back James Hughes with Gibbous Gazette. We're all glad to see his return, but I suspect I'm the most grateful. I was a poor substitute. We also say farewell to the Past President's column, but Martin George promises to keep us informed with his first-hand observations about the state of our profession around the world in regular contributions to the International News column. We're still mulling over what to call his contribution. I'm fond of the Traveling Tasmanian, but I don't think it's professional enough. It suits the man, but not the message.

This also is the final installment of Susan Button's President's Message, and we'll have Martin George's first column as president in March. Susan will continue writing the Mobile News column.

Finally, an apology for the tardiness of this issue. As I write this it is nearly three weeks past my normal deadline, and I know some IPS members won't be reading this until January.

Many of you already know that my colleague at the Ward Beecher Planetarium, Richard Pirko, passed away unexpectedly in October. His tribute appears on page 88, along with another one, for Ron Paris, that was also a loss for my planetarium.

One blow like that I could handle; the second blow did me in. My mother also passed away about two weeks later. Her death was not a surprise because she had been in failing health for several years, but the stress of the bedside vigil along with the many new changes at my day job, arranging the funeral and starting the process of finalizing her estate were too much for me, especially right at Planetarian deadline. As a result, this issue is late and not edited as well as usual.

OK, excuses, excuses. But she was my mother, and I miss her terribly at the moment. It's time to stop writing now.

For the Record
Mike Bruno's correct email is mbbruno@spitzinc.com. I left out the "inc" after spitz in his article about fulldome trends in the September issue. I also attributed the paper to the IPS 2008 conference, but it was presented as part of the 2008 Fulldome Summit that followed the conference.

I'd also like to make amends to the staff at the Space Telescope Science Institute for my wording about John Stoke's move to a position with the National Radio Astronomy Observatory. I wrote that John was "our own connection" at STScI. My only meaning was that he had come from a planetarium background.

Rest assured that John wasn't our only connection; the staff at STScI has always been there for us and continues to be our link to the Hubble. We all owe them tremendously for their great work.

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Planetarium Professionals: A Balancing Act to Engage and Educate

James Croft
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Cambridge, Massachusetts
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Submitted: July 1, 2008
Accepted: October 25, 2008
The dark dome of the planetarium has been illuminated by numerous research studies across the decades, many of which ask similar questions but in different settings. The question “Where does the planetarium optimally lie on the spectrum between education and entertainment?” is frequently posed by researchers in the field, but rarely seems to achieve a consensus of opinion.

In order to attempt an answer to this question, I contacted a number of planetarium professionals who perform a variety of roles in diverse institutions and settings. I conducted in-depth interviews, asking exploring how they conceived their work and the tensions and stressors associated with it. From their insights and information, I have developed a model showing some of the ways in which planetarium professionals structure their work for success.

To frame my study, I did a literature search on planetariums. Significantly, this revealed a dearth of contemporary research, with hardly any studies from the 90's and 00's. Some useful studies from earlier periods were found, however. For example, Smith, in his 1974 comprehensive review of the literature, organized the existing research at the time into three central categories: descriptive studies, comparative studies, and curriculum studies. Descriptive studies “have attempted to describe the status of planetarium operations at various stages in the development of the planetarium” (p.14). Comparative studies are “those studies which compare in some manner the planetarium experience to the traditional classroom situation” (p. 24).

Finally, curriculum studies deal with the effectiveness of planetarium curricula as modes of instruction in astronomy and of themselves, or in contrast to other planetarium curricula. This tripartite classification neatly captures the majority of planetarium research, but points to a problem implicit in the research I have examined: there appears to be a significant disagreement over the proper place of the planetarium in academic and other educational settings.

A small section of Smith's review, titled the "Philosophy of Planetarium Usage," specifically highlights this issue, and Alter (1941), who discusses some philosophical issues related to planetarium usage, is cited. However, it is striking that none of the work Smith cites explores the question of the tension between the educational and entertainment goals of the planetarium as its main focus.

Downing (1971) highlights some of these potential disagreements over the most effective
use of a planetarium. He analyzed responses to a questionnaire about adult education activities that was completed by 145 planetarium directors in the US and Canada. The questionnaire elicited data referring to the “types of programs offered, [the] evaluation techniques used to assess the programs and the progress of the adult learners” (see abstract to the paper).

The participants were also asked to rank eight principles of learning applicable to adult learners. The responses revealed disagreement and divergent practices as well as widely differing levels of success. For example, while many planetarium directors felt problem-centered learning was desirable, much disagreement emerged over how important it was to involve learners in the development of instructional goals. Even in institutions where both these principles were ranked highly, success was far from guaranteed: “problem-centered learning and participation in planning were rarely successfully utilized” (abstract).

A number of studies tracked planetariums across time as priorities and practices change. Petersen (1989) investigated how planetariums across the world were affected by new technology, profiling some which had successfully adapted to keep pace with advancements in computerization and the competition by cinema and interactive multimedia experiences.

Historical Picture

Likewise, Sunal and Sunal (1977) tracked the evolution of the planetarium in education (both formal and informal settings) in order to come to a historically-informed picture of the state of the field across three decades. They found that the goals of the planetarium had remained constant, while the concerns and priorities of wider society molded and reinterpreted these goals to fit the economic and ideological pressures of the time.

As this trend evolved, the means by which planetariums sought to achieve their goals morphed to fit the changing goals and objectives of the institutions in which they were housed. In other words, while the values expressed by the planetariums remained relatively constant, how they met their goals was forced to change by outside expectations. As a result, what was considered “education” and “entertainment” fluctuated.

Similar historical perspectives offered by Norton (1985) and Brill (1982) refer to my research question indirectly. Norton (1985) surveyed the history of planetariums when he asked “Will Planetariums Become Extinct?” He explored the effect of major historical events such as the launching of Sputnik on the state of planetarium usage, and tracked the development of laser rock shows and other high-tech entertainments offered under the dome. He concluded that the most successful planetariums do not stay the same: they change over time to embrace the new desires of the public and compete with wider entertainment offerings while maintaining their core educational mission.

Similarly, Brill (1982) reviewed the state of planetariums against the backdrop of the contemporary technological and theatrical innovations such as Digistar and theatre and dance performances. The rise of a new planetarium concept was tracked: the “space theatre.” Brill saw planetariums of the future offering an expanded range of “artistic visions of the universe around us” (p33). This notion, of the planetarium as a performance venue as well as educational space, may offer a unique perspective on the education-entertainment question. It is important to note that, while Norton was somewhat skeptical of recent trends in planetarium usage, Brill was clearly enthusiastic: another example of the lack of a single reigning philosophy of planetarium usage.

More typically, “experimental” studies tend to deal with the education-entertainment question only in passing, if at all. Ortel (1977) provided a typical comparative study, comparing the performance of students taught astronomy in regular classrooms with those taught in a planetarium. Using official data provided by two community colleges, he found that planetarium instruction was beneficial to all groups of students, and demonstrated how the benefit was more pronounced in relation to the comprehension of certain astronomical concepts.

While assumptions were made regarding the validity of test scores and grade point averages to determine student success, the wide range of tests applied and the comprehensive analysis of the data over numerous subgroups suggest that planetariums can be valuable in educational settings. What it does not elucidate are gains in the affective domain, which have been frequently cited among the primary benefits of the planetarium experience (evidence to back up this supposition is scant, however).

Similarly, Sunal (1973) compared the performance of second-grade children in a wide range of educational goal areas related to astronomy. He studied three groups: one experienced a classroom astronomy unit, the second experienced a combined astronomy-planetarium unit, and the third had no instruction in astronomy or a planetarium visit. Sunal found that students who experienced the astronomy-planetarium unit made gains in all of the ten educational goal areas he measured above those made by the other students. In addition, Sunal notes that those who attended a planetarium unit showed “increased perception and understanding of science principles and processes” (see abstract to the paper) some six weeks after the event, suggesting that educational experiences within planetariums may assist students in tackling scientific material in areas other than astronomy.

Pertinent to the topic of this paper, Reed and Campbell (1972) provide a contrasting view. They directly compared the effectiveness of classroom teaching with a chalkboard and astronomical globe to teaching in a planetarium. Contrary to the findings previously cited, they found that the classroom teaching situation (with astronomical globe and chalkboard) was significantly superior to the planetarium teaching situation. They concluded that planetariums should be most effective when used in conjunction with traditional classroom instruction, and should not be used as a stand-alone “demonstration chamber” for astronomical concepts.

Reed confirmed and extended these findings in a follow-up study (1973). These results are consistent with those of Smith (1966); his investigation compared planetarium lecture-demonstrations with classroom lecture-demonstrations with sixth grade students and also found the classroom setting to be superior.

The contradiction between the results of this research and the previous papers cited is striking, and though some of the difference could be explained by changing practices and research methodologies over the time periods in which the research was conducted, some of
leads to the obvious question: how illuminating can a single-visit, humorous, pre-recorded planetarium show be when these elements may be educationally invalid?

The “education-entertainment” question has been raised more explicitly in other domains. Weinstein (1998) focused squarely on this conflict in his study of “Robot World,” an interactive science museum/theme park. Weinstein’s book looks at the conflict between the educational and entertainment goals of science museums and other science popularization facilities, but does not deal directly with planetariums. In addition, Henderson (2004) presented a compelling series of studies investigating how the Nickelodeon television network became a seminal part of American and world culture. Particularly relevant to the question at hand are discussions of how the network shifted its emphasis from more overtly educational programs to those with a clearer entertainment focus in order to catch a broader market.

Likewise, the research of Singhal and Rogers (2002) also seems appropriate. They provided a theoretical model with which to investigate “entertainment-education,” a concept that was born in the media domain but is beginning to be incorporated by science museums.

Finally, Fisch and Truglio (2000) and Morrow (2005) investigated how Sesame Street, possibly the world’s most famous educational TV show, came to be so successful. Included are discussions of the entertainment-education balance that creators of the show deal with each day.

What’s Missing?

What is missing from this significant body of research is a study of how planetarium professionals consider their own work, how they address the education-entertainment conflict, and how they navigate the constantly shifting social demands and revolutions in technology chronicled in the research cited above. The question explored in this paper, while central to so many others, is always on the far horizon. The current proposed research aims to fill this gap.

Methods

For this study I gathered a sample of seven planetarium professionals selected according to the following criteria:

I was eager to speak with individuals whose experience with planetariums represented the breadth of the field itself. To this end I cast a wide net in terms of the types of institutions (museums, universities, etc.) contacted.

Many individuals are involved in the production and presentation of programs and events, so I interviewed individuals performing different functions within their specific institutions.

Finally, one of the benefits of working within a relatively small field is the opportunity to gather the insights of some of the most respected voices, who represent or have worked within the most significant institutions.

Therefore I ensured that I asked each participant who they would recommend I speak to and followed up on those leads. I began to feel that my sample had been successfully select-
I conducted semi-structured interviews with all of the participants. The interviews were scheduled to last between 45 minutes and an hour. During the interviews I asked each individual a series of questions designed to explore the various tensions implicit in their work in Planetariums. The interview protocol used (Appendix B) benefited from suggestions and revision by faculty and teaching fellows at the Harvard Graduate School of Education.

The completed protocol asked participants to describe:

- What led them into planetarium work;
- Their general philosophy of the role of the planetarium within their institution;
- The process of creating a planetarium show, including a discussion of the educational goals of the program, its method of presentation, and if there were any difficulties in reaching these decisions;
- How they measured the effectiveness of their shows and for their views on the educational and affective impact they had; and
- The relationship between the planetarium and the other educational elements of the institution in which they worked, such as IMAX theatres or museum exhibits.

These interviews were recorded and coded in relation to a number of key themes, some of which I had determined in advance and some of which emerged from early discussions with the first participants. I paid particular attention to statements or anecdotes that highlighted the key tensions that the professionals felt they faced in their work, and their strategies for successfully resolving them. All participants referred to in this paper have been given pseudonyms.

**Results**

My initial hypothesis was that planetarium professionals would be under strong pressure to make their shows more entertaining and less educational in order to meet financial demands of a planetarium. This expectation was informed by my knowledge of recent high-profile planetarium closures due to budget constraints and a perceived waning interest in space. Examples include the McLaughlin Planetarium in Toronto, closed in 1995, and the London Planetarium, which now hosts shows about a different kind of “star” altogether – wax celebrities.2

My results show, however, that resisting the pull of the entertainment world is not the most significant pressure felt by planetarium professionals. The opposite is the case: the individuals in my study found it far more challenging to make the scientific concepts they are trying to communicate intelligible and meaningful to their audience within the medium of the planetarium. When a planetarium show is not successful in the eyes of planetarians, it was rarely because it was too entertaining. More frequently it was too detailed, insufficiently relevant to the audience's level of understanding and interests, and failed to take account of the unique aesthetic approach the planetarium dome requires.

Also, I found an unexpected, but, among my participants, universally acknowledged “existential” component to the work of planetarians: they all see part of the main responsibility of planetarium shows to be the posing of big questions about the meaning and value of human existence. Examples include “Is there life elsewhere in the universe?” and “How did the universe begin?” This finding was strongly related to the unique aesthetic of the planetarium space, which was another aspect mentioned by the entire sample. Through their insights I have been able to incorporate this new information into a model of effective planetarium work which highlights the different pressures acting on planetarians.

**“Don’t Try to be Funny!”—Entertainment vs. Education**

Contrary to my initial expectations, the planetarians I spoke with did not feel that they were unduly pressured towards creating programs that prioritize entertainment over education. All of my participants recognized that such a conflict potentially existed in their work, but none felt it was the most significant of the problems they faced and all were able to overcome it.

When this conflict was mentioned, most spoke of it in terms of a pressure to increase

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1 See Figure 1
2 The London Planetarium was closed as a separate attraction in July 2006, and now functions as an adjunct to the neighboring Madame Tussauds waxworks. The following statement was placed on their website at the time: “In 2006 the Planetarium was rebranded and renamed the Star Dome. The Star Dome is part of the Madame Tussauds attraction and is included in the ticket price. Please note that we no longer show astronomy-based shows”
3 See Figure 2
attendance in response to Omnimax and IMAX. Deana, a planetarium show producer, expressed this most clearly, saying “I think there is some pressure to change—we always have people pressuring us to build up our attendance.”

Some were very clear that their institution or work did not succumb to this pressure. Mandy, the planetarium director newest to the field, said “We don’t have any shows at all that have too much entertainment and not enough content,” while John, a veteran planetarium consultant, joked “We were rarely accused of being too entertaining.” However, he conceded, “It did happen occasionally.”

The planetarians overcame this difficulty through two mechanisms: an extremely strong commitment to what they saw as their core educational mission, and ingenuity in melding the popular with the educational. John made the strongest statement of the former, declaring “There are places I would not work… if someone just expected entertainment programs… I couldn’t do them, and I just wouldn’t do it.” Deanna described a situation that exemplifies the latter:

What we’re really good at is incorporating those ideas without changing what they saw as their core educational mission, and ingenuity in melding the popular with the educational. John made the strongest statement of the former, declaring “There are places I would not work… if someone just expected entertainment programs… I couldn’t do them, and I just wouldn’t do it.” Deanna described a situation that exemplifies the latter:

Not just Pluto. If we told the powers-that-be that we were doing a show about the solar system they would say “No, Don’t do that. That’s too standard, too traditional.” But by putting it under the name of Pluto, we can do good science and do good teaching and keep people interested.

Particularly, popular science fiction shows seem to serve as a catalyst that enables planetarians to fuse the worlds of entertainment and education. Deanna described a show based around Star Wars as “a perfect blend of entertainment and science,” while Nadine, a former planetarium show producer now no longer in the field, talked about a show inspired by Star Trek: “They were going into a nebula, looking at pulsars and different types of stars, supernovas and novas.”

It can be seen, then, that planetarians consider the pressure to be “more entertaining” as part of the wider issue of the interest of society in space at a particular time. When cultural factors converge to make interest in space high, there is no need for them to make any concessions in their programming to bring in an audience. When interest wanes, they find more pressure (often from the parent institution in which they are housed) to move towards the “entertainment” end of the spectrum.

Regardless of the cultural climate, planetarians seem to keep a strong grasp on their educational ideals and exercise ingenuity in packaging their educational content so that it remains attractive.

However, two of the planetarians I spoke with foresaw a potential shift towards a different type of programming. Mandy spoke of a recent conference where “they are doing some really exciting work… that is more entertainment and artistically oriented than science oriented. And I think that is an aspect that would be very important for us in the future in order for us to get people in the planetarium.” Daniel (the organizer of the conference and a planetarium director) agreed, making a strong case for expanding the scope of the planetarium medium. Discussions of the potential of the planetarium to be a space for more than astronomy education centered on the unique aesthetic experience the planetarium offers, the topic of a later section.

Bringing the Stars to Earth—The Devil’s in the Details

The single biggest strain experienced by planetarians in my sample was the struggle to make complex scientific concepts understandable to their audiences within the aesthetic medium described above. All of my participants, when describing planetarium shows that were not successful, described situations in which they had not been able to convey the scientific ideas they had hoped to at the outset. Deanna described one such show:
We went with a topic that isn’t traditionally done in the planetarium (the weather)... we alternated presenter-recording-presenter-recording—which sounds great, but it’s very jarring. We tried using demonstrations with props and carts—it’s hard to get some difficult concepts to come across. And although the dome is a good space for immersing people, as we discovered it isn’t a good place for demonstrations as not everyone has a good vantage point. A combination of show topic, show name, format of live presenter/recording—it didn’t work out very well.

Daniel outlines another potential pitfall, remembering that “The mistake we always made was trying to do too much...trying to convey too many messages rather than saying something significant about one message.” Ben described similar difficulties, saying “We have a real problem in our profession of being too enthusiastic, and expecting the public to rise to that level.”

A final trap was outlined by John, who described the difficulty of effectively visualizing certain concepts:

The Big Bang... is one (area) where I had a few problems. Scientists like the microscopic scale... They talk about the microphysics that’s going on at the beginning of the universe. The number of times I’ve tried to do that – I don’t think the average person can get to the microscopic scale and be comfortable, and understand the nuclear physics that’s going on there... I’m very careful not to get people into realms that are unimaginable.

A number of difficult considerations that must be weighed for a planetarium show to achieve its goals—the show’s topic, name, format and content, are mentioned as hurdles that must be overcome. Mistakes in any of these areas can derail a show, affecting its potential for engaging the audience or conveying its scientific messages.

A Place of Inspiration

More than simply conveying certain concepts during the show, however, all the planetarians with whom I spoke saw the planetarium as a place in which people would be inspired to want to know more. The planetarium was seen as a starting point for future discoveries, rather than the end goal. Nadine stressed this capacity, saying she wanted the audience to think “Oh my God, I didn’t know about that!” and “Oh my God, I want to know more!”

Daniel, similarly, wanted to “change people’s attitudes and motivations about science” as well as communicate specific pieces of scientific information.

Finally, Ben suggested that “If a show’s good enough, it gets them to appreciate science, want to learn more and see how it connects to their lives.”

In general, it seems that planetarians are tug of scientists trying to make their shows more scientifically detailed than they felt their audience would be able to understand.

Daniel described this situation most clearly: “I had research astronomers as my steering committee. So it was effectively five against one... I had a huge battle with the astronomers teaching them the rules and principles of informal scientific education... I had to fight them tooth and nail.” John described similar battles, saying “Sometimes it’s over the content ‘Oh it can’t really be like this! Pluto doesn’t really look like this! Pluto is not really a planet!’” Experienced planetarians drew on their past mistakes and successes to resist these pressures, and often had to fight hard for their vision to be realized.

In addition to these conflicts, three of the planetarians also strove to bring their coworkers towards a more audience-friendly position. Nadine, for example, told of how she had to work hard to convince her colleagues to think from the perspective of the audience rather than the perspective of a trained scientist. Similarly, Daniel described how, through collaboration over the creation of astronomy-related museum exhibits, he educated his astronomers colleagues towards prioritizing clarity over absolute accuracy.

In general, it seems that planetarians are successful in this leadership role, making educators out of their co-workers. Indeed, John described a striking phenomenon which he had observed a number of times: “I’ve had this happen—almost a role-reversal, where all of a sudden the designer’s so wedded to the con...
tent that they won't budge, or the scientist is defending aesthetic decisions. I wound up trying to pull the designer off the science concept and trying to convince a scientist he's not really a film-maker. And it was my job to stand in the middle.”

John went on to describe this “in the middle” role. “I'm a bit of a hybrid... what I call 'in-betweener’ - someone who can be in both worlds. I can go out into the experiment lab and talk to the people doing experiments on neutrinos, and turn around and work on a children's book... I think as professionals we are in-between, hybrid people.”

This concept of “in-betweening” seems central to understanding the work of the planetarian. The most effective shows, as described by the participants in this study, are those which have a strong grasp of the science allied with a deep understanding of the audience's current levels of understanding and potential misconceptions. The planetarian, to be effective, must play three roles: a scientist, an educator, and, to a certain extent, an entertainment artist - and it is striking that six of the seven planetarians considered themselves, in certain respects, to be artists when creating their shows. This concept, the planetarian as “professional in-betweener” moving between three worlds, comes close to articulating the full, extraordinary range of the work planetarium professionals perform. To understand the artistic side of the planetarians' work, however, the aesthetic of the planetarium must first be considered.

**Starry Sublime— The Planetarium Aesthetic**

The planetarians expressed remarkably similar ideas about the “aesthetic” of the planetarium. Themes that occurred repeatedly, and seemed to be key to this aesthetic, were

- The immersion offered by a planetarium dome;
- The central role of music;
- The importance of taking the audience on a “journey”;
- The presence of a live presenter; and
- A peaceful and relaxing environment, aided by the slow pace of planetarium shows.

Deanna describes the immersive aspect, explaining that the planetarium “is not like watching something on TV or reading something on the internet when you can't become part of the experience...you can really bring people into the experience.” Mandy echoed the same principle when she said “It's an immersive medium. When you're in the dome, and the lights are out, it's totally different from watching a movie. A movie has clear rectangular boundaries. And you're clearly outside it...But when you're in a planetarium the show is all around you - you're inside it.”

The feeling of “really being there” beneath the stars, aided by the theatre's domed shape, was a touchstone that all the planetarians referred to repeatedly. Nadine was referencing this immersive quality when she said “I want to give them the experience as if they were in space.”

John spoke to the importance of music. Not only does he “pay a lot of attention to music,” but he sometimes uses musical forms as inspiration for the pace of a show. “I do take a lot of models directly from music. I often think of the movements in a symphony - you have to have some quiet movements, along with some louder ones.”

“I do take a lot of models directly from music. I often think of the movements in a symphony - you have to have some quiet movements, along with some louder ones.” He even recalled one occasion in which a whole show was ruined by a score that “sounded like ‘Phantom of the Opera.’ Kids came out of the show walking like Quasimodo! It was a wonderful, spectacular failure.”

All the planetarians expressed a desire to take their audiences on a journey, and many of the titles of their shows demonstrate this; *Passport to the Universe and Into the Unknown*, are examples. Daniel describes this aspect well, saying “We begin with what they had in front of them - the night sky. Then we go further and further out into the sky to see different things, and communicate different scientific principles on the way.”

Also importance to the planetarians was bringing the audience back to Earth before they left - four mentioned this specifically. Daniel continued: “The important thing for me has always been to ground them. To say ‘This is all effectively available to you if you look up.’ I always bring it back to relevance.”

Indeed, the desire to relate the planetarium experience to everyday life was frequently expressed, and it seems that this is metaphoricaly represented in the show itself by bringing the audience back to Earth at the end.

Ben, an experienced planetarium director, expressed the same sentiment, saying “We generally try to bring them home. A solar system show will end back on Earth. You always want to connect it back to Earth, and humans, and our journey.” It is striking that the faster pace of an IMAX or Omnimax movie, and with the pace of society as a whole. The planetarium was seen as a space in which people could slow down for a while, and engage in a more subdued setting.

The most forceful expression of the planetarium's unique aesthetic came from John, who likened the experiences offered under the dome to the Kantian idea of the sublime:

Immanuel Kant wrote about the “sublime,” and it does match and it really guides my programs. I think it's one of the keys to moving people emotionally... and the planetarium can play into that very well. One is called... the mathematical sublime, and that is where there's a kind of infinity. The starry sky fits into that, because you can't count all the stars, and yet they seem to go on, and everything seems big. You have a kind of mathematical or geometric infinity when you look at the stars. There's another type of sublime, called the dynamical sublime, of when you have a lot of power, as when you watch thunderstorms and hurricanes. This is the dynamical sublime and planetariums can evoke that as well. I actually think about these things when I produce and make [planetarium shows] because this is one way to touch people. But it's not a narrative way... It's based on the power of the universe.

It is clear, then, that the planetarium offers aesthetic capabilities that are in many ways beyond other educational and entertainment media. The environment of hushed awe this aesthetic promotes is quite unique, and per-
happens offers insight into why the planetarians in my sample felt a strong responsibility to pose questions probing the relationship between humankind and the universe.

Towards the Boundary—Posing Big Questions

To me, the most surprising element of the ways in which the planetarians in this study described their work was their unanimous commitment to asking (and trying to answer) “big questions,” and to helping audiences come to a fuller appreciation of the beauty of the natural world. Each and every one of them articulated this as one of the central goals of the planetarium:

John: I think people come to planetariums for an ‘off the earth experience,’ often dealing with the biggest questions...I think discussions of the Big Bang, which is an edge or a boundary, and questions of extra-terrestrial life, which come up routinely, are about the limits of life and life as we know it...where we are in the universe is a boundary question too.

Nadine: Astronomy’s important because it poses by philosophers, theologians and scientists alike.

The planetarium, with its unique aesthetic allure, is an extraordinary powerful space within which to pose and confront these perennial dilemmas of humankind. That the planetarians in my sample universally realized and testified to this speaks to their deep understanding of the work of the planetarian is fundamentally existential in nature. The questions described in the above quotations are ones of human significance within the unimaginably vast universe; they are questions that have been posed by philosophers, theologians, and scientists alike.

The planetarium, with its unique aesthetic appeal to an astronomy education goal, is an extraordinarily powerful space within which to pose and confront these perennial dilemmas of humankind. That the planetarians in my sample universally realized and testified to this speaks to their deep understanding of the potential of their institution, and their remarkable skill as professional hybrids.

Discussion

The planetarians in my study spoke with striking agreement on the key issues and conflicts that infuse their work each day. Where there were disagreements they tended to be minor, but some stand out as potentially significant. The relationship between the planetarium and other entertainment-education spaces (like IMAX cinemas) was seen differently by different participants, for example. Some, such as Deanna and William (based in a museum), did see the IMAX as a competitor with the planetarium for audiences, and wished their institution would allocate the same level of resources to promoting the planetarium as they did the IMAX.

Mandy, on the other hand (also based in a museum), felt that the presence of an IMAX cinema in her institution would be beneficial to the planetarium, as the IMAX could provide more entertainment-oriented shows for those who wanted them, freeing up the planetarium to focus on more purely educational content: “If we had an IMAX cinema, that is already a big eye-candy sort of a venue [but] we are never going to have the funds to have an IMAX cinema here, so the planetarium really has to do double duty for us – almost like an IMAX-lite.”

This disagreement neatly encapsulates differing attitudes towards the IMAX and other, newer technologies that could be seen to be encroaching on the planetarium’s space.

The second area of significant disagreement concerned the use of the planetarium dome to provide non-astronomy content and experiences. While both Mandy and Daniel were extremely positive about using the dome in a wider range of ways, John expressed greater skepticism, suggesting that the domed space was simply not well-designed to offer certain content.

While Daniel talked with enthusiasm about work he had seen exploring subatomic particles in the planetarium, John stated that this...
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The award-winning full dome experience about the ocean and its fragile habitats.

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would not be something he would work on without being convinced beforehand that it could be done effectively. These differing views have implications for Brill's (1982) concept of the “space theatre”—it seems that the debate over what range of experiences planetarium domes can best offer is as current now as it was then.

Finally, various levels of enthusiasm were expressed towards the shows that mixed pop culture references with science education, such as the *Star Wars* and *Star Trek* shows discussed earlier. While all my participants recognized that such shows could be both popular and educationally useful, Nadine suggested that they should not be too frequent a part of a planetarium’s program, while Mandy called for a balance of “popular” shows with more educational ones. Such concerns did not seem to hold sway at Deanna and William’s institution; however, the *Star Wars* show developed there has been brought back over a number of years and is frequently offered.

Even with these disagreements, though, from the insights of the seven participants in my study, a clear picture of how planetarians conceive their own work emerges. Their shows succeed, and the true vocation of the planetarian in this setting is fulfilled, when they are able to harness the unique aesthetic medium of the planetarium to present accurate, current scientific concepts in a way that is meaningful and relevant to a general audience, while posing questions that spur viewers to think deeply about their place in the universe. This model of successful planetarium work is represented graphically in Figure 3.

Planetarians do not see their role to be the conveyance of completely accurate scientific information. They recognize that they must make allowances for their audience and are willing to sacrifice absolute conceptual fidelity in favor of greater clarity.

They hone their ability to decide how much detail to relinquish over years of experience, taking note of occasions when they have not been entirely successful and ensuring they do not make the same mistakes twice. Perhaps this finding can alleviate some of Fisher’s (1997) concerns: the primary goal of planetarium shows, according to the participants in this study, is not to convey specific astronomical concepts.

Instead, shows are considered a success if they inspire audience members with a desire to find out more, and imbue them with a greater reverence for the cosmos and the scientific process in general.

Finally, the planetarians in my study see themselves as professional “in-betweeners,” who straddle three professional domains: they are scientists, educators, and artists working within a unique artistic medium.

When planetarians are successful in navigating these treacherous and complex demands, the rewards are great. John, describing his favorite of the shows he had worked on, gives powerful voice to this potentiality:

> I thought the show was successful because a lot of people... were really emotionally moved. One woman was in tears, and one woman wrote me this letter about how it changed her life. How many people can say a program they’ve worked on has done that?

### Bibliography


(Please see *Directors* on page 25)
How many high schools have and use a planetarium with an actual astronomy course? What influence are portable planetariums in the high school venue? What are the parameters that describe the related astronomy course, such as course size, school specifications, and teacher backgrounds?

These were some of the research questions behind a spring 2007 survey of high school astronomy courses (henceforth called simply the Survey) that made up the author's doctoral dissertation at the University of Georgia (Krumenaker, 2008). Nearly 300 high school astronomy teachers, including a number of International Planetarium Society (IPS) members, responded to an invitation to take part in the 55-question mixed-methods survey which had quantitative, categorical and qualitative questions asking teachers to describe their high school astronomy courses in some detail.

Among the circumstances investigated were the makeup of the student body; background information on the instructors; course characteristics such as duration and frequency; effects of the No Child Left Behind Act (NCLB) and its Adequate Yearly Progress (AYP) yardstick; and what materials such as textbooks, planetariums, and telescopes were used. In this article, results of the planetarium portion are presented.

Some History

Of the many planetariums installed during the heady years of the space age, there are now only around 1100 active in the US, of which only around 350 are in high schools today (Peterson, personal communication). Nearly 30 high school astronomy teachers, including a number of International Planetarium Society (IPS) members, responded to an invitation to take part in the 55-question mixed-methods survey which had quantitative, categorical and qualitative questions asking teachers to describe their high school astronomy courses in some detail.

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Some History

Of the many planetariums installed during the heady years of the space age, there are now only around 1100 active in the US, of which only around 350 are in high schools today (Peterson, personal communication). The 2005 IPS Directory lists about 275 planetariums that are clearly in high schools (IPS, 2005), though if an astronomy course is taught there cannot be directly assumed. Only planetariums that clearly indicated they were in a grade 9-12 high school were counted; it is possible that we missed some because they simply listed themselves by school name (i.e. Central School) or by just the district name. The Directory is not complete; others were found on the listing of planetariums on a web page of Sky & Telescope magazine, www.skyandtelescope.com/community/organizations, for example. Portable planetariums are harder to pin down, but we got some help from Starlab sales representatives and others. We believe the figure of 350 may well be about right.

Jeanne Bishop (1980) reported that there was almost a one-to-one correspondence in high schools between the existence of fixed planetariums and astronomy courses offered in the 1970s. In Bishop's time portables were new and rare, and one wonders what effect this number of portables has on the existence of a high school astronomy course today, and even if high schools are using them. Of the 275 high school planetarium listings we tallied in
the 2005 Directory, 10% were portables clearly owned by the school itself. The natural question, then, is does Bishop’s finding still hold today and do portables have the same influence on course existence as fixed domes?

Portables owned by a district (or area educational organization, such as a museum or board of cooperative educational services) available on regular loan may help the teacher but one could also hypothesize that it will be of a lower influence on whether a stand-alone course exists, akin to field trips, i.e. “borrowing” another facility for a day. One can hypothesize that portable usage probably depends on whether, like a fixed dome, the portable is always at the high school and available when needed, or shared with other schools.

A 1986 survey by Harvard’s Philip Sadler (1992) was the most recent look at high school astronomy courses before this study, but planetariums were not examined in his research, though some of his general findings would be of useful comparison.

The Survey

The Survey, performed primarily over the Web, used a number of sources to identify planetariums to include in the study. A primary source was the 2005 IPS Directory located in the Fernbank Science Center library in Atlanta. We also had an invitational message posted on the Dome-L mailing list and one in the 200,000-subscriber newsletter for the “Starry Night” software program and the newsletter to Starlab portable planetarium operators. Other planetarium astronomy teachers saw our announcements on other listservs, such as ESPRIT (an earth science mailing list), various National Science Teacher Association and American Association of Physics Teachers’ regional listservs, and more.

We also made our own collection of names to contact using lists of planetariums found in print and online, such as from the Sky & Telescope website, from some of the Starlab dealers, and several American regional planetarium groups’ web pages. We also found lists of high school astronomy clubs with contacts, some of which had otherwise “unlisted” planetariums.

During our solicitation periods we occasionally received lists of people to contact directly and some of these were planetarians. We used “snowball sampling,” getting more names from people who already had chosen to answer the questions. Overall, the list had 600 names with email addresses.

Additionally, we accumulated about 2200 postal addresses which were used in a later survey. Although not all responses were complete enough to use, still our 237 usable survey responses constitute a 40% return. Though we clearly have a minimum of 2800 high school astronomy teachers, the number is actually larger; we state without proof at this time that the number of high school astronomy teachers is actually closer to 4000, with 3200 being what one might call regular classes.

In the Survey, teachers were asked if their school either (1) owned a fixed planetarium that they could use anytime, or (2) if they used a fixed planetarium elsewhere, and for both, how often did they use it per course. Also, (3) did they use a portable planetarium and, again, if so, how often and who owned the unit? Finally, (4) did they not use a planetarium of any kind, or (5) was there some other option that was not listed? (The “other” category gathered some new information, but also received a lot of answers that really belonged with the given choices.)

The proportion of “own fixed planetarium” is quite high. If 26% of all high schools with astronomy classes had planetariums, there would be around 900 high school planetariums in the country. This is three times what is known to exist. This survey clearly oversampled the planetarium part of the high school astronomy population, but this should make the statistics derived here more statistically valid, truly representative of the reality.

Only two “owned fixed” schools reported usage statistics, and those were “every day” and “15x per course.” It is interesting to see how many portables show up in the sample. We have already noted that the 275 high school planetariums in the IPS Directory contained about 10% portable units. Out of our 28 “used a portable”

<table>
<thead>
<tr>
<th>Table 1 - Planetarium Ownership (Number, Percentage)</th>
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<tr>
<td>Owned Plm</td>
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<td>62, 26%</td>
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Dr. Larry Krumenaker recently earned his Ph.D. in Science Education at the University of Georgia in Athens, Georgia, but has been in astronomy and astronomy education since the 1970’s. He started out as an astronomy major at Case Western Reserve University, Cleveland, Ohio, has taught astronomy at numerous colleges in the Northeast and South, written extensively as a science journalist, and spent 13 years crawling in and out a portable dome as a traveling planetarian in Texas and then New Jersey. The UGA experience came after being a high school physics teacher and adjunct college astronomy instructor in Atlanta.
results, 8 were owned by the school which brings the percentage of high school-owned portables in our sample to about 3-4% of all high school astronomy courses and they are used at about one-third the rate of fixed domes in courses of astronomy.

We conclude that owning a portable unit is a fixture of a minimum of about 3-4% of all high school astronomy courses and they are used at about one-third the rate of fixed domes in courses of astronomy.

Twenty-six of the portables-using schools reported usage rates. These were as indeterminate as “as much as I want” to a numerical peak around 20 days per course. Several appear to use it for an extended, single time, such as “first one, two, or three weeks of the course” and various multiples of “5 days” that appear often.

When borrowed from a district or some other source, the average usage days are smaller. Of 14 appearances of 1, 2 or 3 days of usage, 10 were when the portable was not the school’s own. This usage rate is much less likely to be seen in school-owned planetariums; only 2 schools out of the 9 reported such low usage. One can conclude that ownership at the school of a portable unit does imply it is used and used frequently at a similar rate to a fixed planetarium (where the astronomy class does not normally meet in the dome).

The Response to Field Trips

In the “other” category were found numerous references to field trips, with the implication in some, and the explicit statement in others, that these were to other planetariums.

Quite a few responses included the fact that this was no longer a good option. Out of 12 such statements, 5 mentioned irregular usage if at all, and 7 mentioned that the expense of a field trip had become too costly. These statements go neither into “used pm elsewhere,” where field trips clearly are still done, nor into “none.”

Of those that clearly indicated they used a planetarium elsewhere, 36 used it once per course. Only once did a school use another facility as many as six times and then only because it was within a nearby former high school building. Nine reported using it 2 to 4 times per course, and one said weekly. The majority did not report usage amounts.

There were 14 remaining “other” categories of which 3 were a combination of the regular choices and 9 were a new choice we hadn’t used on the survey, the use of sophisticated computer software, so-called “planetarium emulation software” on large-screen projections, televisions or monitors, or interactive boards. This software projects the night sky, provides accurate planetary system motions and can be used by students as well as instructor.

The primary choice is the computer program Starry Night. Also mentioned were Voyager 4 and Stellarium. Table 2 lists sources and data on the software.

The Classrooms in the Planetarium

Does a planetarium make any difference in the makeup of an astronomy course? Does having one help a school’s AYP status? What are the backgrounds of the instructors? In the results that follow, the information refers to those courses and instructors that use planetariums and teach a high school astronomy course.

The statements may not hold for those planetariums where the planetarian serves everyone else but the instructor does not teach any actual classes of his or her own at the high school level.

This subset of the Survey was divided into four groups:

- those with fixed domes for their class use (fixed domers),
- those who have onsite and accessible portable planetarium units (own portables),
- those that borrow a portable from some other owner or site (borrowers), and
- those who used software as their planetarium. This last group is too small for any good statistical value and won’t be considered further.

Those survey respondents who do teach an astronomy course with a fixed dome are the majority (64, counting a couple of “other” that use fixed and portables, which makes their statistics more likely to be significant. In terms of geographic distribution, more than half of the fixed domers are in suburban schools (55%), which might be expected as suburban schools are likely to be more affluent than urban (29%) or rural ones (10%). This differs little with our overall Survey.

Those high schools that own portables have a distribution almost identical to fixed domes but those that borrow are more than three times likely to be in rural districts.

The Survey found astronomy classes in a pool that is 87% public schools and 13% private, nicely the same ratio of all schools in the U.S., whether they have a dome or course or neither. However, fixed domes with courses attached are nearly always public schools (94%) and portables are owned more often by public schools than private ones, by a 2:1 ratio.

Borrowers in this sample were strictly pub-

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Table 2 - SOFTWARE CONTACTS

<table>
<thead>
<tr>
<th>Software</th>
<th>Contact Information</th>
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<tr>
<td>Starry Night</td>
<td>Published by Imaginova, Inc.</td>
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<td></td>
<td><a href="http://www.starrynightstore.com">www.starrynightstore.com</a></td>
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<tr>
<td></td>
<td>800-252-5417</td>
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<td>+1 925-838-0695</td>
</tr>
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<td>Stellarium</td>
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(List probably is not complete; omissions are not intentional)
The vision of the International Year of Astronomy 2009 is to help the citizens of the world rediscover their place in the Universe through the day- and night time sky, and thereby engage a personal sense of wonder and discovery.

All humans should realize the impact of astronomy and basic sciences on our daily lives, and understand better how scientific knowledge can contribute to a more equitable and peaceful society.

The IYA2009 represents an excellent opportunity for the planetarium community to not only further their activities, but reach new audiences. The IYA2009 is constantly growing in the number of people and organisations involved, but also in the number resources it makes available to its partners. The IYA2009 trailer is for instance available in 43 languages, as well as in fulldome format. This is a unique resource for planetariums and science centres.
erage of 1.3 astronomy teachers per school, which translates into about two-thirds being solo teachers.

Since clearly most teachers do not teach just astronomy courses (in the Survey, only perhaps 1 in 7 are “full time astronomy teachers”), what do they do for the rest of their paychecks? In Sadler’s day, astronomy was a bonus on top of physics classes. Today, the number one “second course” slot for planetarians is filled by earth science; indeed for fixed domers, 38% list this as a course they teach and this is also true for 50% of the dome borrowers.

Only for portable owners does physics still come to be their “second course,” at 50%, but the statistical bases are small for portable users anyway. A third place tie between physics and physical science exists for fixed domers, and chemistry comes last.

But in actual second place for “thing to do” for fixed dome teachers is being the planetarium director, doing shows for other teachers’ classes.

Bioscience courses rank second for anyone who teaches with a portable.

For the Survey as a whole, physics was still barely in the lead, 39% against earth sciences at 35% and physical science teachers numbering 27%.

In conclusion, it appears that planetarians come mostly out of the earth sciences and then the physics/physical sciences domain, unlike the teachers of Sadler’s day or the rest of high school astronomy teachers today.

NCLB and Highly Qualified

The No Child Left Behind Act has created a need for teachers to be “highly qualified.” No state offers teaching certification in astronomy, so other definitions need to be used to determine whether a teacher is qualified.

If this is defined by the undergraduate major, then from 75% (the portable owners) up to 90% (the fixed dome teachers) of these planetarians are highly qualified, having majors in the sciences or science-specific education areas, comparable to the whole Survey’s teacher pool’s 83%.

Many fixed domers and portable users have masters degrees (77 and 100 percent, respectively)—we counted any kind of masters degree, even if not science or education; 63% of the borrowers have earned master’s degrees. This means they are more educated than some other teaching groups, but doesn’t make them “qualified.”

The number of doctorates is very small in number, a mere 8% of the Survey and 6% among the full domers, the only subgroup large enough for valid statistics here. This is not “highly qualifying,” but that’s not uncommon in any field of science teaching.

In the Survey, only 8% of all high school astronomy teachers were astronomy majors, i.e. possess an astronomy bachelor’s degree. Five percent of the fixed domers had an astronomy major but some non-majors went back and earned masters and even doctorates in astronomy, making 11% of this subgroup “astronomers” in credentials.

None of the portable owners were astronomy majors, but a third of them earned master’s degrees in the subject. Borrowers are comparable to the Survey, at 6%. By this standard, most astronomy teachers are not qualified.

However, of key interest to the planetarium world should be not just the undergraduate major but the amount of astronomy training, and therefore content knowledge. In Sadler’s survey, most teachers of high school astronomy got their knowledge from a hobbyist perspective, not from a major or coursework.

In this Survey, the situation is vastly better; 85% have taken at least one course in astronomy at undergraduate, graduate or both levels. But this leaves 15% of all high school astronomy teachers never having taken an astronomy course at any level. Inside the domes, the numbers are better—and worse.

Portable owners do not show even that well, with 25% never having had an astronomy course in college at any level. Given that 33% of them went on to get masters degrees, portable unit owners are dichotomous; they either have a lot of astronomy or they have none.

By this standard, most teachers are “highly qualified,” though, in general, most teachers take only two courses of astronomy. There is, though, a significant minority that has not, and thus should be considered not highly qualified.

The Advantages of Planetariums

Planetarians have at least two advantages over those not so equipped. First, they have a much higher classroom budget (excluding equipment purchases and other purely planetarium-operation aspects), averaging $1159 for a fixed dome classroom and an amazing $1929 if the school owns a portable. By contrast, the average high school astronomy teacher has an average budget per course of two to five hundred dollars.

Secondly, more often than not, the current planetarian teacher inherits an existing course. Only 40% of the fixed dome teachers created their course, compared to 65% of non-domed teachers. Portable users, whether borrowers or owners, are much closer to non-domers, 53 or 64 per cent, respectively, in the act of creating their astronomy course, which might be expected as they otherwise are classroom teachers.

The Survey also queried these teachers on their perceptions of the future, for their own local situation (school) and for courses nation-wide as a whole (nation). They were asked to choose an attitude on a five point Likert scale ranging from 1 for pessimism up to 5 for optimism. If anything, planetarians in fixed domes or with their own portable units are as optimistic or more optimistic for their own courses’ futures than the whole Survey pool. For the nation, they are not quite as optimistic; generally the “center of mass” of the attitude spectra is just barely above neutral.

Summary

In summary, our survey of high school astronomy courses indicated that about 10% of all astronomy courses have regular access to a fixed dome planetarium. Another 3-4% have continual access when desired to a portable dome and a similar, and rapidly growing, percentage use computer “planetarium software” as a substitute. When a dome, fixed or portable, is owned by the school housing the course, it is used up to 3 weeks per semester of the course. When a high school course doesn’t have a planetarium but does get to use one elsewhere (or owned and borrowed from elsewhere), it is usually but for a single lesson.

In a summary form, high schools with astronomy courses and some kind of in-house planetarium usage are generally suburban, more in public schools than private ones, and generally in schools as large or larger than...
The birth and evolution of planetariums began almost one hundred years ago. Planetariums were built in many places, including Chicago, where the first one in America was built in 1930. The first planetarium in Russia (or in the USSR, as it was called in those times) was built in Moscow one year earlier, in 1929. The number of planetariums swiftly increased after the beginning of the Cosmic Era, inspiring young people and children to gather knowledge about the sky and allowing them to dream about space exploration and traveling in space. Now there are more than 3500 planetariums in the world and about 40 in Russia.

Because of the difficult economic situation starting in the 1980, governmental support for planetariums and many other cultural and educational organizations was cut off for a long time. Although the rest of the world was developing and implementing the new technologies of digital projection and 3D graphics, Russian planetariums were forced to stand down and use only what we already had. There was an understanding that if this situation continued, soon there would be no place for planetariums in the area of visual entertainment.

Like many other planetariums in Russia, the Nizhny Novgorod Planetarium was founded after World War 2, in 1948. The place of its construction wasn’t good; it was built within an old Russian monastery. That situation had a strong influence on planetarium structure and its abilities. At the beginning there was installed a simple optical projector made in Moscow, but it was changed to a Zeiss Skymaster ZKP2 and planetarium worked with it until the reconstruction process.

The city of Nizhny Novgorod is one of the most industrial and scientific centers in Russia, located about 640 kilometers (400 miles) to the east of Moscow. The level of the city gives it cause for high public attention for astronomical education and people interested in the sky and astronomy. So, because of that, there is a scientific council in our planetarium led by honorable scientists of our city, many of whom are known in Europe and the United States. The current chairman of the council is a Russian Academy of Science correspondent, professor in astrophysics V.V. Kocharovsky. Also Nizhny Novgorod Planetarium had an initiative to organize a Russian Planetarium Association in 1994 and it
Nizhny Novgorod Planetarium has archived a leading role in Russia among all planetariums. That gave us the ability to begin the process of constructing a new planetarium building in May of 2005 and receive full support from city and state authorities. The building would have been impossible without that support.

The process of building the new planetarium began at the same time as the reconstruction of the Nizhny Novgorod City Circus, located on same street. There also are a movie theatre and one of the biggest malls in our city on the same block. Because we have four entertainment buildings in a couple of minutes of walking distance at the bank of Oka River with a beautiful view, we located in a place that is very good for public attraction.

The new planetarium is not just the simple facility that it was before; we planned and built a complex of four auditoriums and an observatory. I think the last, the observatory, is a very rare thing. In Nizhny Novgorod, with a population of 2 million people, there are only a couple of observatories: in one institute and on the roof of the astronomy laboratory at the state university!

**The Biggest Achievement**

The new building, of course, is a major achievement. But the biggest achievement is the new big dome of new planetarium. The planetarium complex consists of four auditoriums. The first and main is a new 54-ft dome, the “Star Theatre,” that seats about 180. The second is the “Astronomy” dome, the new home of the old ZKP2, which still works very well. The third is called the “Planet,” a small movie theatre type of facility to demonstrate stereo programs.

And the last - the “Cosmonautics” hall - is a special place, not just for Russia but, I think, maybe for the rest of the world. It was here that we installed a completely real Soyuz TMA spacecraft training simulator. This spacecraft was recently used by astronauts traveling to the International Space Station and back. There are only three of these training simulators in Russia: in Zvezdniy City, where cosmonauts and astronauts are trained; in Novocherkassk, where this equipment is built; and now in our planetarium in Nizhny Novgorod. So, every visitor now cannot only look upon the stars under the dome, but also feel like a real astronaut docking with the ISS or traveling a couple of orbits around the Earth.

The heart of our planetarium is the new, big Star Theatre dome. The construction of the 54-ft half sphere itself was a very difficult problem for workers, but they were successful and in 2006 the dome was installed.

We were then faced with an even bigger problem: which fulldome visualization system to select? We looked for the best solution and tried to choose between the well-known popular products. But, at the end, we came to an extraordinary decision. We decided not to buy a readymade system, but to develop a new one. And here the young Nizhny Novgorod programming company, “Argus Computer Vision,” comes with help.

The key of our “Argus Digital Planetarium” system is a six-projector design, composed of F30 digital projectors. They provide a sky resolution about 3k x 3k pixels or 9 megapixels. Each projector is controlled by a single workstation PC, which in turn are synchronized by a main workstation, which also provides sound playing. There is one more server, the most powerful of them all, that is used for show production. The playback and show production software are so simple and so universal that you can install them on any modern PC you have!

**That Edge-Blending Problem**

The main problem in our case, as in every multi projection system, is that of edge blending. Digital projectors can’t give us a real black color; they always produce some grey. If you have single, good-quality projector you’ll never see the gray, but in multi projection systems the intersection of grey gives us more light grey, and everybody can see that. So, in our case, that problem became our number one issue because we needed stars on an almost black sky. This problem was successfully solved by Argus.

On the opening event of the new planetarium in October, 2007 we achieved almost ideal edge blending under the dome. And Mr. Martin George, the past president of IAS, who was at that event, noticed, that the result that we archived is one of the best he’d ever seen. (See Past President’s Column, December 2007 – ed.)

Mr. George saw only four projectors covering 75% of sky, but now, with a fully-functioning system, we cover the entire dome.

As the base for show production software, Argus chose the open source astronomical application Stellarium. It was completely upgraded for use in fulldome projection. Stellarium provides us with the ability to see the stars, space and our planetary system with a good level of 3D graphics and details.

What did we change in Stellarium? First, we gave it the ability to render video files based on scripting codes that describe actions inside Stellarium. All those actions can be played and rendered to video. The video file renders with 9 megapixel resolution with special fish-eye projection.

Secondly, we now can import any video file in any scene and show it in any part of dome. So, simply, we can watch ordinary movies under the dome with dome correction. After that correction we have the sense that the movie is on a screen and that screen is hanging in the space under the dome.

We also gave Stellarium the ability to import extra 3D models of spacecrafts and asteroids and potentially other things as well. Also
we now can use inside Stellarium high-resolution textures of any object up to 20k x 20k! Little by little we are adding to Stellarium all the modern 3D graphic technologies now in use in computer games and visual effects.

In one of the last stages, we are working together with Intel Graphics on an educational program which was opened in Nizhny Novgorod State University.

The rendered program, a large file, is cut into six parts, according to the number of our projectors. The way it is cut is determined by a special calibration matrix that describes the position of projection. The Argus program that combines all of the producing functions is named “Show Creator.” As I already noted, the program can work on any ordinary modern PC. But using high resolution textures or HD movies raises the system requirements to RAM and VRAM.

The average rendering speed of a show is about 1 or 2 frames per second, so to render a 20-minute program you need approximately 5 hours. The final show consists of six video files in a standard AVI container, compressed by open source XVID video codec. The entire size of a 20-minute show is less than 2 GB, but size strongly depends of the level of action in the show.

To transfer a show from one configuration to another (or possibly from one planetarium to another) we can use the source file. Possibly that option will be very useful when other digital planetariums open in Russia in the future.

So, that is the way we built the new Nizhny Novgorod Planetarium, the first Russian modern, digital planetarium. We were very proud that the result of our work received a good assessment from Mr. George, and more importantly, from the public and visitors in Russia.

The planetarium provides hundreds of events for the public and visitors, including always celebrating the important dates in the history of space exploration and astronomy. Special dates include April 12, the flight of the first man in space, and World Planetarium Day.

Nizhny Novgorod Planetarium always has had a main role in Russian Planetarium Association (RPA) events, and preparation is already underway for the celebration of the 400th anniversary of telescopic astronomy and the International Year of Astronomy 2009.

Since opening in 2007 the planetarium has produced two big fulldome shows, one for general audiences and other for just for children, and a number of short programs that show the stars and constellations during the year. Now we are prepare two more complete fulldome shows about extraordinary objects in the universe and the Milky Way galaxy.

And, at the end of my message, I want to quote one of the honored guests of our planetarium, Cosmonaut Victor Baturin, who said that he will not be surprised if, after 20 years, half of all cosmonauts in Russia will be from Nizhny Novgorod because in childhood they see the stars under the dome of our planetarium. Because of us, the universe becomes closer.
(High School, from page 21)

those that have classes without planetariums, and larger than the average U.S. high school overall. They exist in schools at least as AYP Passing as the entire Survey pool, which in turn is higher than the U.S. school norm.

Teachers teach approximately two sections of astronomy classes, rarely teach alongside other astronomy teachers in their school, with classes averaging 22 students, except in high schools that own portables where classes are smaller.

Teachers are highly educated, the great majority having masters degrees and with science or science education undergraduate majors. But few are astronomers by their degrees and beyond those, most of the rest took two or fewer courses in astronomy; from 11% to 25%, depending on category, (that’s 22% overall) have had no courses whatsoever, which puts increased pressure on their “highly qualified” status.

Beyond their astronomy classes, the instructors teach mostly earth sciences, with physics usually a strong third place and physical science or biosciences making up much of the rest. An exception is among fixed domers, for whom being the planetarium director, operating the planetarium for others, is the second most likely other activity they do after teaching an astronomy class.

Planetarium instructors are generally even more optimistic for the future of the courses in their local school than they are for the average non-dome-equipped teacher, and they are a little more optimistic for courses throughout the nation than most, but not by much.

Finally, did we reach a statistically representative sample such that we can make these claims with assurance? In regards to planetariums, the top four states in the 2005 IPS Directory are Pennsylvania (81), Indiana (25), Ohio (21), and New York (17). Our Survey’s top states in terms of responses are Pennsylvania (11), Ohio and Indiana (6), Texas and Wisconsin (5). In this regard the survey matches the IPS proportions rather well.

On the basis of the geographical distribution and the matching proportions of portable and fixed domes in the Survey and the Directory, we feel this study’s findings are truly representative of high school astronomy courses that use planetarium equipment in any of the three categories.

Final Thoughts

It seems to be that portable planetariums have not had the same influence as fixed domes in high schools, despite more than two decades of availability and their lesser cost. Yet, when they are owned by a school, they are used as often as a fixed dome, therefore one can conclude that a teacher can get access regularly to some kind of dome, it will be used significantly for education and not a novelty.

Borrowing a portable is no better than a field trip, a change of pace but not likely to be a useful tool overall. Therefore, it seems no surprise that “planetarium emulation software,” a relative newcomer to the astronomy teacher’s arsenal and easier to obtain, is already up to the same level of usage as portables.

It would be facetious to say that having an astronomy class (or a planetarium) will cause the high school to Pass AYP even if high schools with this status are a higher percentage than the U.S. norm. It is more likely that astronomy courses disappear when a school fails AYP. This doesn’t mean it can’t hurt to have an astronomy class in such a school; the known interest and enthusiasm among students with the addition of more language arts and math activities within the class can likely help the school get back to AYP.

This author is aware of a few cases where high school astronomy teachers lost their positions because they were not highly qualified. Since no state offers a teaching certificate in astronomy and there are few, if any, masters of astronomy education, a new definition of highly qualified needs to be made that can satisfy a state licensing board or school district.

Declaring that a highly qualified teacher needs to have a major in astronomy would be a disaster for the field; having at least a science or science education major is a good start. Having a teacher with no astronomy coursework at all, regardless of major, cannot do a field well.

Among teachers in planetariums, there is a significant percentage who has never taken a course. We propose that the combination of having a minimum amount of coursework and an appropriate science content or science-domain specific education (e.g. physics education) degree should make a teacher highly qualified.

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(Directors, from page 16)


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THE OTHER SIDE OF INFINITY
BLACK HOLES

Gobbling up audiences worldwide.

NARRATED BY LIAM NEESON
MUSIC BY RICHARD FIOCCA

Produced by DENVER MUSEUM OF NATURE & SCIENCE

Funding provided by the National Science Foundation and NASA

BLACK HOLES: THE OTHER SIDE OF INFINITY is a Denver Museum of Nature & Science production, supported by grants from NASA’s Gamma-ray Large Area Space Telescope program and the National Science Foundation. It is directed by Thomas Ducrot and produced with the National Center for Supercomputing Applications. Science advisors include Dr. Andrew Hamilton (University of Colorado) and Dr. Lynn Cominsky (Snowy Range University). Distributed by Spitz, Inc. Approximate 33 minutes. Image © Denver Museum of Nature & Science.
New discoveries are being made every day in astronomy and astrophysics. Physical sciences are enriched through astronomical studies, and for the fields of physics and chemistry, the contributions by astronomical studies are enormous. To have clear understanding in physical sciences, knowledge of the forces operating in our cosmos is crucial for the future generation.

Further, the society we live in comprises persons with different professions, different beliefs, different educational backgrounds and different age groups. People in our society have misconceptions about scientific and astronomical facts. To ward off unscientific thoughts, education in astronomy becomes necessary. The planetarium is an important place to render astronomy education and thus planetarians have enormous social responsibilities.

Using a balanced script narrated through a speaker system, inspiring astronomical information on recent research, explanation of constellations and methods to identify them, mythological information or some other amusing stories with cartoons, are presented in a normal planetarium show. Melodious and suddenly fluctuating background music to keep the attention of the viewer, colourful illustrations and animations, special effects, etc., are best suited to the requirements of normal visitors.

However, accompanying the normal visitors we get a good number of visitors with hearing impairments. In the state of Tamilnadu in India, there are several institutions serving the hearing impaired. The students from these institutions visit the Tamilnadu Science and Technology Centre, where they visit the science galleries and learn by hands-on activities. They also visit the planetariums, but they do not gain much information merely by looking at the images shown there.

**Woes of Hearing Loss**

India is a very populous country so the number of deaf people cannot be definitely estimated. It is known to be in the millions. In children, hearing loss can lead to social isolation. The child experiences delayed social development that is tied to delayed language acquisition. In order to bring cheer to the lives of such children and to provide education on astronomy, the B. M. Birla Planetarium developed a planetarium show exclusively for them.

During the past two years, Tamilnadu Science and Technology Centre organized a good number of “spend-a-day-in-science-centre” programmes especially for the hearing impaired. In these programmes scientific facts were taught with the help of a sign language interpreter.

Sign language uses manual communication, body language and lip patterns instead of sound to convey meaning. The programmes were successful, as they were well received by the special audience. This success was an inspiration for us to develop a planetarium programme exclusively for the hearing impaired.

For this programme a simple script was developed and it was interpreted by a sign language interpreter. It was filmed and was projected using a LCD projector in a corner of the planetarium dome. After the presentation of each small paragraphs of the script, the appropriate animation or picture or constellation or celestial navigation or special effect presentation was shown.

**Show Considerations**

The following were the considerations for the development of this show:

1. Simple and straight-forward script: in normal scripts we use ornamental descriptive words; here the content is short and the time is lengthened to enable the students to view the pictures as well as the interpreter’s sign language;

2. Application Oriented: The focus was on basic astronomical concepts, such as celestial navigation, seasons, reason for seasons, etc.; and

3. Illustration Rich: pictures were provided with texts and pointers. Hearing-impaired children score significantly below norms on language and reading measures. However, some of them who became hearing at later stages can read text easily.

The first programme thus developed was given the title “Sun and Planets” and was inaugurated on June 12, 2008. Children from several schools for the hearing impaired were invited to the program. The students gathered for at least three jam-packed shows at the sky-theatre. Some of the special schools also have sections for vision-impaired students. For these students, the script in Braille was circulated to enable them to know the content in advance.

After the inauguration, a special show is offered at least once a week for the special children.
When you combine a community experiment to quantify by how much our night sky has degraded, a planetarium valued by its school district, and a small grant, then mix all that with the serendipitous timing of the International Year of Astronomy 2009, the results are Let There Be Night, a collection of dark sky resources for the planetarium community.

Art Klinger, director of the Penn Harris Madison (PHM) Planetarium in Mishawaka, Indiana, and I wanted to promote local astronomy events that dovetailed with the global celebration, so we turned to a small grant source with which we had had success for the 2004 Transit of Venus program. As it happened, when we looked at the 2008 Toyota TAPESTRY grant application, it stated “In Environmental Science, areas of interest include: light pollution; sustainability of natural resources…” Ah, serendipity, indeed.

Why Should I Care?

While outdoor lighting issues were my monomaniacal pursuit du jour, Klinger realized not everyone would have the same interest level as mine. Ever practical, he assumed the role of a disinterested visitor and asked, “Why should I care?” When I was able to satisfy his inquiry, especially when it came to saving money, it seemed the TAPESTRY grant, the planetarium, and the topic of light pollution were a natural fit and the timing was perfect for IYA2009.

We proposed a science experiment to quantify how much of the night sky has already been lost across the entire school district. All students in grades 3-8 would measure existing sky glow in March 2009 in concert with Globe at Night (www.globe.gov/GaN), a Cornerstone Project of IYA2009.

Prior to the community-wide experiment, all students would visit the planetarium for an introduction to outdoor lighting issues. The PHM School Corporation was quick to embrace the effort, especially since student involvement entailed real science investigation.

While the TAPESTRY grant paid for the tools for the community-wide science experiment, we wanted to connect the disparate planetarium modules with a common storyline. Our aim was to keep the show interactive, making it well suited for small and portable domes. A production budget was not in the original grant, but GLPA offered financial support to get a sky show underway.

The result was Let There Be Night, which uses Galileo and his major discoveries as a vehicle to introduce light pollution and its impact, to describe how to quantify the darkness, to ponder the future of the night, and also to tie the project more closely to the major IYA Globe at Night project.

To pay for studio production costs, we sought to leverage the TAPESTRY grant with additional support from a local Toyota dealership. In our first visit, after showing the TAPESTRY guidelines and the “Star Party with the Barzdukas” Toyota commercial, our local dealer quickly said, “We’re in—we’ll match the grant.”

1 All IPS members are receiving two DVDs that are the result of the Let There Be Night project in this issue of the Planetarian, thanks to the support of the National Optical Astronomy Observatory (NOAO). However, because we doubled the discs when we gained noteworthy content, further free distribution is undetermined as of this writing. In the U.S., consult your regional planetarium association. GLPA will distribute individual copies at cost through its online store at www.glpaweb.org/zencart5.

2 Although not on the Let There Be Night DVD, this astronomy-themed commercial is available online at www.toyota.com/vehicles/minisite/sequoia/experience/#/star-party. Based on our favorable experience, you may want to consider seeking financial support from your local Toyota outlet during IYA2009 in exchange for showing the advertisement in-dome through your Internet connection.
Artwork from Second Life

In lieu of standard artwork, we created scenes within Second Life (secondlife.com), an online virtual community for mature audiences that is also populated by hundreds of colleges, museums, and other learning centers. There we filmed two animated characters, called avatars, interacting in a digital reconstruction of the courtyard at Galileo’s villa in Arcetri, just outside Florence. The lead characters are Galileo and a visiting mouse from the future who takes him to the modern era and beyond.

In addition to capturing video in Second Life, we also sought to drive planetarium guests to the site for a post-planetarium experience. Though Second Life admittedly is accessed by and appeals to a limited audience, we feel the planetarium community could benefit by reaching out through new media such as this. The Let There Be Night building is hosted in Second Life on the Astronomy 2009 Island, which was contributed by Interstellar Studios, creators of the PBS program 400 Years of the Telescope (www.400years.org) and the planetarium program Two Small Pieces of Glass.

We don’t claim to be slick producers of fulldome extravaganzas, time is constrained, and our budget nowhere near approaches the requisite funding needed for such a production (which was so well conveyed by Mike Bruno in “Trends in Fulldome Production and Distribution” in the September 2008 issue of the Planetarian).

An Amalgam of Products

Rather, the Let There Be Night DVD is an amalgam of home-spun products mingled with quality material from generous donors. Our plan was to gather existing resources and create some original content for an interactive planetarium program under small and portable domes. With the permission of the copyright holders, we proposed sharing the collection on a DVD with other planetarians. Several groups were quick to step up:

- The Lunar and Planetary Institute (LPI) and storytellers Lynn Moroney and Dovie Thomason shared an audio recording of a Pacific Northwest Nations story about the balance between day and night from LPI’s SkyTellers program.
- The Southeastern Planetarium Association (SEPA) allowed us to reproduce its Saving the Night planetarium program, written and narrated by David Levy.
- BOB CRELIN AND AMIE ZINER, creators of the children’s book There Once Was a Sky Full of Stars, digitized their story for distribution in video format.
- Additional digital content has flowed in since the beginning of the planetarium program, so on the Let There Be Night DVDs we are providing as much material as possible to dark sky advocates:
  - Stars Above, Earth Below, a video capturing the magnificence of the night from Tyler Nordgren’s tour of U.S. National Parks; images and narration courtesy of Nordgren;
  - Dark Matters, a general introduction (approximately 15 minutes) to outdoor lighting issues, a video written by John McMahon and produced by Dani DuRall;
  - Perpetual Twilight, a PowerPoint presentation from the Illinois Coalition for Responsible Outdoor Lighting;
  - A Stellarium planetarium script on magnitudes and the diminishing starfields, courtesy of Karrie Berglund;
  - Dark Skies, an animated video segment conveying the impact of light pollution on sidwalk astronomy; courtesy of Tim Brothers;
  - The song “In This Light,” performed by and courtesy of John Kaufmann and Dan Dennis of Starball (www.emutt.com:16080/star-ball);
  - The song “Lucifer’s Bait,” courtesy of Bandazian (www.bandazianmusic.com);
  - The song “Shoulders of Giants,” courtesy of the Johannes Kepler Project with words and music by Padi Boyd and performed by The Chromatics (see story on page 30); and
  - Globe at Night teacher and family activity packets and valuable resources from the National Optical Astronomy Observatory (NOAO).

By having this diverse collection of material at their disposal, we hope that planetarians, teachers, and other users can tailor their presentations to the ages, needs, and interests of their audience.

The Let There Be Night video itself is divided into ten chapters. In the PHM Planetarium, Klinger interweaves live segments with select chapters from the DVD, depending on who is visiting. For example, with K-2 visitors he begins by showing There Once Was a Sky Full of Stars. He then conducts an effective demonstration with toy cars and a Maglite® in “candle mode” to convey glare, sky glow, and light trespass. Finally, in line with the Globe at Night theme, he plays the Legends of the Night Sky-Orion laser show from Audio Visual Imaging.

To prepare the PHM teaching staff for the March 2009 data collection experiment, the PHM Educational Foundation purchased copies of the DVDs for each teacher. Also, Klinger and I have visited each of 14 schools twice for 20-minute in-service presentations. In response, PHM teachers have begun to create and share activities and lesson plans that they can interweave with their existing curriculum. These will eventually be uploaded to the Let There Be Night website, www.LetThereBeNight.com.

It’s Still a Community Project

Although the Let There Be Night project has grown, it still remains, first and foremost, a community experiment to quantify by how much our night sky is degraded.

The 2009 Globe at Night campaign is scheduled for March 16-28. During that time, all students in grades 3-8 in our local district have been assigned to visually observe Orion from their backyards, while small teams of students will quantify sky glow from their 14 respective schools with hand-held Sky Quality Meters (SQMs). 3

To show visually how much of the night sky has been lost, the students will plot the Globe at Night data with LEGO® blocks on a local map. Different sky glow values, as sug-

3(www.nightwise.org/sqm.htm).
The two *Let There Be Night* DVD discs included in this issue of the *Planetarian* support dark sky advocates in the planetarium and beyond. Disc 1 contains three feature videos that will appear on a menu upon insertion into a DVD player. Disc 2 contains five more videos that will automatically come up as menu items on a DVD player.

Be certain to load Disc 2 into your computer, too, where you can access additional valuable resources, including time-sensitive material for Globe at Night. The compilation on Disk 2 includes activities, audio files, PowerPoint presentations, documents, songs, star count instructions, and more listed at www.LetThereBeNight.com/dvd.html.

*Let There Be Night* asserts the old model for outdoor lighting no longer works. Just as Galileo recognized that the prevailing way of thinking about the night sky had to change in light of new, compelling evidence, so we must reprioritize the tradeoffs of outdoor lighting technology. Modern scientific observations indicate that, in addition to the heritage of our night sky, at risk are natural habitats, personal security, human health, energy, and money. The planetarium community has a clear role and obligation to confront this challenge.

Because of lack of time, not all of the material art and I would have liked to share made it to the DVDs. We’d like to add more video clips, such as modeling the experiment results with LEGO blocks, a light pollution demonstration under the dome with a Maglite® flashlight in “candle mode” and a fun demonstration with a large group of kids simulating turtles hatching on a beach. Look for links for the additional content at website, www.LetThereBeNight.com.

**Users may not alter or publish the original copyrighted material on the Let There Be Night DVD discs without permission of the respective owner. The creators of There Once Was a Sky Full of Stars have given permission for limited use in planetarium programming as part of IYA2009 activities. For example, you may use the still images where provided to make slides in sync with the provided audio track. However, you may not upload the video to, say, YouTube or sell the video for profit.**

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**Johannes Kepler, aka John McFarland; johanneskepler@att.net**

**Padi Boyd, for The Chromatics and AstroCappella; padiorama@gmail.com**

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**Just wait until you see that on the Shoulders of Giants...**

...we’ll see beyond!

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The Johannes Kepler Project and The Chromatics are happy to announce the release of the AstroCappella song “Shoulders of Giants.” This song was commissioned by the Johannes Kepler Project, written and arranged by Padi Boyd, and performed by The Chromatics specifically for the International Year of Astronomy 2009, and now is being made freely available for use by other IYA projects around the globe.

The song celebrates Galileo’s first glimpse of the heavens through his telescope and the astonishing pace of discovery ushered in by his observation. An earlier version of the song debuted at the American Astronomical Society/Astronomical Society of the Pacific meeting in St. Louis, Missouri, last summer.

“Shoulders of Giants” is being used as part of the Johannes Kepler Project’s 2009 Astronomy Music Video Contest. The contest involves making a music video by synchronizing images to the lyrics and tempo of “Shoulders of Giants.”

There are four categories:
1. Middle School - 8th and below
2. High School - 9th and up
3. Graduate - 18 years and up
4. Artist - original song and video

The top prize is $500 and a telescope. The deadline for entries is January 7, 2010, 400 years to the day that Galileo first viewed Jupiter’s moons, on January 7, 1610. Complete contest rules will be posted in January 2009 on the Johannes Kepler Project website at www.johanneskepler.org.

In hoping that the song will strike a harmonious chord with people and be used in a variety of other IYA projects, The Chromatics and the Johannes Kepler Project are making it freely available for such use, asking only that the appropriate credits be given to the composer (Padi Boyd), the performers (The Chromatics/AstroCappella) and the Johannes Kepler Project. Please note, however, that the use of the song as part of a commercial project will require a copyright release from the project.

The song and lyrics can be downloaded from The Chromatics’ AstroCappella website at www.astrocappella.com/IYA.

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Chuck Bueter is a member the IYA Dark Skies Working Group.
Bring the surface of Mars to your planetarium!


Join an expedition to the intriguing Red Planet and search for evidence of past life in this 20-minute full-dome planetarium presentation.

For more information on this show and others available for your planetarium, contact John Radzilowicz at RadzilowiczJ@CarnegieScienceCenter.org, or call 412.237.3399.

Produced by Buhl Planetarium at Carnegie Science Center.

www.CarnegieScienceCenter.org

One Allegheny Avenue | Pittsburgh, PA 15212 | 412.237.3400
The Future of Fulldome

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Abstract: Fulldome is the term given to immersive theaters and spaces where images are displayed on a dome-shaped screen. Born out of the need of planetarium theaters to project video images of astronomical data, fulldome is rapidly becoming a new media environment used to present scientific data, entertainment shows and unique live presentations. This paper is a technically-orientated perspective of the current and future trends of fulldome within a five-year horizon. (Paper first presented at Fulldome Summit 2008 in Chicago.)

The more it Changes...

The classic saying “the more it changes, the more it stays the same” applies today to fulldome, particularly with respect to display technology. The factors that drive fulldome display choices are common across large format displays. In the early 1980’s, CRT projectors dominated the large-screen market (although large is relative, of course; screens of 2 meters in width were considered large at that time).

An emerging alternative came from videowalls, typically comprising an array of large (28 in) monitors. By stacking monitors in 3x3, 4x4 or even larger arrays, bigger, higher brightness displays could be created. By 1992, very large displays were built using this approach, culminating in the world’s biggest: the 850 square meters in width were considered large at that time.

By then, the first high-brightness LCD projector was launched with 1,000 lumens and VGA (640 x 480) resolution. This, many thought, spelled the end for making big displays out of many smaller ones as projectors would only get brighter and more resolve. So it did, and so it continues. But with it, so did the insatiable appetite for larger screens and more resolution. So instead of these higher resolution, brighter projectors stealing market share from the multiple monitor/projector displays, they simply served to make “bigger and better” even easier. With the explosion in flexible format and multiple projector arrays came a wide range of devices for controlling them, and for generating and distributing the many pixels across the display for image blending, signal conversion and formatting, picture-in-picture windowing, and other pixel processing features.

So what of fulldome? It has certainly benefitted from the driving demands of other markets. As projector performance increases and prices drop, affordable performance is within reach of many theaters. But is it enough? Have we yet reached a satisfactory level of performance so that we can now use the reducing costs of technology to free up budget to invest in much needed quality content? Well, if all the other display markets and the trends in the last 25 years are anything to go by, the answer is most likely not!

Technology

Various display technologies are employed today to create fulldome images. They fall into two main categories:

Light valve projectors. Light valve projectors use a fixed light source (lamp) and a set of optics to focus light onto a single or multiple imaging device (multiple devices are used to improve color performance or contrast). The imaging devices modulate light via a fixed array of reflective (DLP™ or LCoS™) or transmissive (LCD) pixel modulators.

Emissive scanned projectors. These projectors typically use the same technology to create light and to modulate the image. CRT projectors fall into this category (which are now almost obsolete), as do some versions of laser projectors. A beam of light is created which scans across the video frame whilst, at the same time, being modulated to create each pixel.

Both solutions rely upon a reflective dome surface to create an image. The gain (reflectance) of the dome surface has a significant impact upon image performance, both in terms of brightness (luminance) and contrast.

A significant factor for fulldome technology is that it is unlikely that the market itself is able to support the development costs and sustain the ongoing development of any dedicated technology. It will, therefore, have to rely upon developments targeted for other applications and adapt them for use in the dome.

These applications will include uses where image fidelity is important, such as home cinema, digital cinema, and simulation. Light valve projectors, because of their use across a range of markets, are the most cost effective and mature technology in use today.

Other existing technologies and near-term developments may well be suitable for fulldome use. Much is talked of LED domes, for instance. LED is an emissive technology which already offers a broad color gamut (saturation), contrast, and light output. They also have excellent life (tens of thousands of hours) and stable light performance over time.

LED displays are a direct view technology and could be applied in such a way as to minimize scatter (light cross bounce in a dome).

However, to get the necessary resolution and fill factor (gaps between pixels) to compete with projected solutions along with suitably graded LEDs\(^1\), the price is likely to continue to be prohibitive for the foreseeable future. Other interesting projector technologies include laser scanned light valves. These use a laser to create the light source, and work with conventional imaging devices to create the picture. Another option is the LED projector, which simply uses LEDs for the light source. Both approaches promise a very stable, long-life light source and a broader color gamut.

Resolution

Using multiple projectors, it is becoming relatively cost effective to produce fulldome display systems (360° by > 160° field of view) of between 16 to 18 pixels per degree (3k x 3k)
22 to 24 pixels per degree (4k x 4k). Those with a higher budget could consider a range of the latest 4k resolution projectors to get close to 50 pixels per degree. All of these solutions require more than one projector and with it, a solution for edge blending, projector calibration, and ongoing maintenance.

Single projector solutions for smaller domes are in use today, typically running a maximum of 5 to 6 pixels per degree (1k) resolution. As 4k projectors become more cost effective in the next few years, small single projector domes will be able to make the leap to 10 to 12 pixels per degree. However, they are likely to lag multi-projector resolution by a factor of four until such time as the change for more pixels abates (which could be a while, if the past is anything to go by).

Prototype 8k resolution (8,000 pixels x 4,000 pixels) LCoS™ imaging devices have already been shown. Expected to be on the market in the next two to three years, this format will again raise expectations.

Brightness

A topic of some debate. For many years, brightness of a dome has been an issue, primarily due to the use of CRT projectors which have very low brightness\(^2\). The typical luminance of a large fulldome theater (say above 18 meters) with a CRT projector would be less than 0.5 ftL (foot lamberts), and sometimes as low as 0.1ftL. Today it is quite common to exceed 0.5 ftL, and as much as 1ftL or more with light valve projectors. Those familiar with the cinema industry will expect 8ftL or more, but the environment is quite different because of the light scatter created in a dome. After all, due of the way the human eye works, brightness is relative. Of more importance is contrast. A dome with 0.5ftL with a high contrast will look significantly better (and even brighter) than one with 1ftL and low contrast.

Contrast

It is important to understand the various criteria that contribute to system contrast in a dome. The first is the projector contrast, typically quoted as sequential contrast (the ratio of a brightness of a full white image divided by that of a full black one). Sequential contrast ratios are improving all of the time. Conventional light valve technologies are in the range of 2,000:1, whilst optimized projectors are now exceeding 10,000:1 and approaching 30,000:1. Dedicated ultra-high contrast projectors using extra modulation stages or optimized optics have been launched recently.

These projectors have a sequential contrast approaching and exceeding 1,000,000:1. This new benchmark for sequential contrast will continue to increase over the next few years, with figures possibly exceeding 5,000,000:1.

The second contrast factor is the ANSI contrast ratio of the projector. Rarely quoted, this is a standard measurement technique using a checkerboard test pattern (a 3x3 array of black and white squares), measuring the average white level and dividing by the average black level. This method takes into account the optical path of the projector and its ability to minimize internal scattered light. The light from the white areas of the image will contaminate the black area to various degrees. The lower the internal scatter, the higher the ANSI contrast. Figures well below 100:1 are typical; higher than 150:1 is very good.

The final contrast factor is the dome screen itself. By its very nature, the dome is a “light scatter machine” that bounces projected light in all directions, but mostly back to itself! When fully lit up, the system contrast falls dramatically into single digit figures. Using the same checkerboard measurement process that is used for projectors, dome system performances can be compared; anything above 81 is very good. So, unlike almost any other display system, contrast in a dome varies massively with content; anything from 101 (a bright video scene) up to 1,000,000 (a starfield), if the projector is capable.

In summary, display system resolution is likely to continue to rise as a direct result of the increase in native resolution of projectors. Domes of 100 million pixels are foreseeable at the high end with multiple projector solutions. Smaller domes will be served either by single, high-resolution projectors, or by two, three, or four projectors using lower-cost products supported by automatic alignment systems and dealing with the need for image matching as the lamps age.

Brightness will start to plateau at between 0.5ftL and 2ftL, as the need to optimize contrast will drive screen gain down (trading brightness for much needed contrast), until a revolution in screen technology comes about.

Image Processing

To drive these high-resolution environments, high-performance computing platforms are typically employed, using hardware graphics engines developed initially for HPV (High Performance Visualisation) applications, and more recently for the gaming industry. Parallel graphics channels are used to increase performance, where, typically, a graphics pipe (computer and graphics card) will be dedicated to serve a single projector. Dual-headed (or even quad-headed) machines can be used to serve more than one projector for simplicity or cost reduction. However, with the increasing demands of software applications to run in the theater, care should be taken to allow for sufficient graphics processing power for the future.

Images are either generated in real-time (in the same way that a computer game works) or are pre-rendered (like a DVD). Real-time applications need some storage for the data to be processed and are very demanding on processor power. Already today, data can be streamed live from the internet (or another data source) to be processed for display onto the dome, and these domes can be connected together to show common data, using remote presenters to steer the journey concurrently across multiple theaters.

This trend is likely to continue pushing the demand for high bandwidth data pipes into the theaters. An important advantage of real-time systems is that they can easily generate content in the native resolution of the display, so as display resolution increases, so will the content resolution from a real-time system.

Pre-rendered content typically plays from either a computer hard drive or an array of hard drives. Certain image compression techniques can be used to reduce the file storage size and the pixel throughput capacity, and are likely to be used for mid- to low-end systems to optimize budgets.

Image fidelity will become increasingly important as advances in digital cinema raise the benchmark for audience expectations. Uncompressed playback will become the benchmark; image bit depth will increase from 8 bit (16 million colours) to 10 bit (1 billion colours—about 1 billion more than 8 bit!), and image frame rate will move from 30fps (the number of unique image frames per second) to 60fps, reducing motion artifacts as images are panned across the dome.

Using technology developed for data intensive applications, hard drive arrays can be configured for massive storage for varying the high pixel throughput required for high resolution domes. The production budget increases significantly as dome resolution, frame rate and bit depth increases. New software tools and production workflow methods are evolving to reduce the time cost of production, data storage is constantly becoming cheaper and larger (terabyte drives are already with us), and higher resolution cameras will become more commonplace.

However, production at 4k x 4k resolution is expensive, and with a shortage of good quality content in the market at present, production costs need to fall in the short-term.

Multiple Sources

Already it is becoming increasingly com-

(See Please see Fulldome on page 79)
Minutes of the IPS Council Meeting
Conference Room
Adler Planetarium
Chicago, Illinois USA
June 26 & 27, 2008

* indicates action items

In attendance:
President Susan Button
President Elect Tom Mason
Past President Martin George
Treasurer Shawn Laatsch
Secretary Lee Ann Hennig

Affiliate Representatives:
- Treasurer Shawn Laatsch
- Past President Martin George
- President Susan Button

Affiliates not in attendance:
- Southwestern Association of Planetariums (SWAP) - Donna Pierce
- Russian Planetarium Association (RPA) - Yaroslav Gubchenko for Zinaida P. Sitkova
- Rocky Mountain Planetarium Association (RMPA) - Dan Neafus
- Southern Association of Planetariums (SEPA) - John Hare
- Southwestern Association of Planetariums (SWAP) - Donna Pierce
- Ukrainian Planetarium Association (UPA) - Slav Gubchenko for Zinaida P. Sitkova

Affiliates not in attendance:
Russian Planetarium Association (RPA) - Yaroslav Gubchenko for Zinaida P. Sitkova
Southeastern Planetarium Association (SEPA) - John Hare
Southwestern Association of Planetariums (SWAP) - Donna Pierce

Affiliates not in attendance:
Ukrainian Planetarium Association (UPA)

Guests:
Larry Ciupik - Adler Planetarium, Chicago, Illinois, USA - IPS 2008 Conference Host
Jon Elvert - Chair, IPS Outreach Committee, and Pennington Planetarium, Baton Rouge, Louisiana, USA, IPS 2012 Conference Bid
Omar Fikry - Alexandria Library, Egypt - IPS 2010 Conference Host
Paul Knappenberger - Adler Planetarium, Chicago, Illinois, USA - IPS 2008 Conference Host
Dr. Jacques Guarinos - IPS Media Coordinator and Astronef Planetarium, St. Etienne, France, IPS 2012 Conference Bid
Shoichi Itoh - Japan Planetarium Association Paul Knappenberger - Adler Planetarium, Chicago, Illinois, USA - IPS 2008 Conference Host
Dr. Dale Smith - Chair, IPS Publications Committee
Prof. Subramanian - Planetarium Society of India
Ryan Wyatt-Morrison Planetarium, San Francisco, California, IPS 2012 Conference Bid
Sharon Shanks, Executive Editor, Planetarian

The meeting was called to order at 9:00 A.M. by President Susan Button. Susan welcomed everyone to the meeting and introduced IPS 2008 Conference Hosts Paul Knappenberger and Larry Ciupik of the Adler Planetarium. Paul welcomed Council to Chicago and Larry presented an update on conference events, highlights and general procedures. President Susan Button thanked our hosts and their staff for their hard work on conference preparations and for the Council Meeting arrangements. Following the introductions of Council members and guests, Susan recognized new Council members and reviewed the format for the Council meeting as well as changes in the agenda.

The Secretary's Report on the Minutes of the 2007 Rio de Janeiro, Brazil Council Meet-
Affiliate Reports

Written Affiliate Reports were reviewed and Affiliate Representatives highlighted events and concerns from their respective reports. Past President Martin George presented his proposal for Standing Rule changes regarding Affiliate Representation—discussion was tabled until Friday. NPA Representative Lars Broman asked if the Star Partner members were included within the regional count of membership and Membership Chair Shawn Laatsch replied in the affirmative. Shawn will distribute a survey to IPS Associates and Star Partners in an effort to ascertain why they have not converted to standard IPS Membership.

In Affiliate News from the floor:

SWAP Representative Donna Pierce inquired about how we determine the locations of portable planetaria.

Discussion centered on efforts to learn where new facilities are installed and how to make contact with those and other portable planetaria that are already in existence.

RMPA Representative Dan Neafus reported on the challenges of holding regional conferences and sustaining regional membership. Among other suggestions discussed, it was agreed that using the conference to promote your planetarium with the public/outreach arms of your community and emphasizing the benefits of regional membership would help support those efforts.

PPA Representative Gail Chaid reported on the issue of school planetarium closings—her personal experience as well as the issue on a larger geographical scale.

The Affiliate Reports were filed.

Conferences

IPS 2010 Alexandria Conference: Dr. Omar Fikry of the Library of Alexandria, Egypt reported on plans for the June 26-30, 2010 IPS Conference. Council discussed the proposed budget, hotel/conference accommodations, and conference events. The Finance Committee will be meeting with Dr. Fikry over the course of the Chicago conference and with follow-up meetings prior to the IPS Council Meeting next year.

IPS 2008 Chicago Conference: The update for this conference was delivered earlier in the meeting; however, Council discussed other issues related to IPS 2008 and future conferences.

Scholarship funds were offered for conference attendee support this year. President Susan Button reported on how those funds were dispersed and asked for suggestions from Council on how the process could be improved.

*The Finance Committee will draft a proposal for guidelines on scholarship funds in support of conference attendance. The proposal shall include a procedure of policy which addresses application, funding, and follow-up/evaluation of the participant/process.

Suggestions from Council included the following:

- offer a standard amount to each requestor (for example, only registration fee, not travel/room/board)
- stipulate that the source of the scholarship be from: host institution (whose budget incorporates the scholarship funds), vendor sponsors, or other sources
- make available lower cost hotel/accommodations
- provide assistance for roommate arrangements
- require an evaluation/follow-up filed by the scholarship recipient
- require participation by the recipient in the conference (paper/workshop/etc.)
- strive for excellence and monitor the process
- International Relations Committee can assist in this process.

Standing Committee Reports

Standing Committee Reports were presented, reviewed and discussed. *Full reports and updates will be posted on the individual Committee WebPages on the IPS Website.

Awards Committee

Chair Lars Broman presented the IPS Awards Committee Report. The IPS Fellows, IPS Service Award, and IPS Technology and Innovation Award honorees will be presented to the membership at the IPS Luncheon.

*The procedures for awarding the President’s Plaque will be added to Appendix A.

Council discussed the importance of Affiliate Representatives acting on behalf of their membership to nominate deserving candidates for awards. The Secretary will add a note to the Affiliate Responsibilities Document regarding Award nominations.

The 2008 IPS award recipients are:

IPS Service Award: Shawn Laatsch
IPS Technology and Innovation Award: Steve Savage
IPS President’s Plaque: Past President Martin George
IPS 2008 Fellows: Agnès Acker, Suzanne Gurton, Aase Roland Jacobsen, Lars Petersen, Raymond Worthy

Elections Committee

President Susan Button presented the IPS Elections Committee report on behalf of Chair Steve Mitch. Steve and the Committee called for nominations in March of 2008, and as of May 30, 2008, six individuals were nominated for the office of President-Elect. Only one replied in the affirmative to accept the nomination. He is:

David Weinrich
Planetarium Director
Minnesota State University-Moorhead
1104 7th Avenue South
Moorhead, MN 56563 USA

For the offices of Executive Secretary and Treasurer/Membership Chair, Lee Ann Hennig and Shawn Laatsch were contacted and asked if they would like to run as incumbents for the offices they currently hold; both agreed. No other individuals were nominated to run for Executive Secretary or Treasurer/Membership Chair.

At the Business Meeting during the conference, additional nominations for the three offices will be accepted from the floor.

Upon the conclusion of the Chicago conference, the Elections Committee will contact all the nominees to send along their documents containing biographies and candidate statements. These will be posted on the IPS website and included with the ballots that will be mailed in October of this year. The 2004 and 2006 elections were administered electronically and the 2008 elections will be conducted electronically as well.

Publications Committee

The IPS Publications Committee: Chair Dale Smith reported on the activities of the Committee.

The roster of Associate Editors has grown to include: Thomas Wm. Hamilton as editor of the “25 Years Ago” column; Steve Tidey has moved from “Forum” to the “Education” column; Gary Lazich is new editor of “Forum.” Editor Sharon Shanks has completed her second year as Executive Editor and also writes an insightful “In Front of the Console” editorial column in each issue.

Chuck Bueter will step down as Advertising Coordinator later this year after four years of excellent service and Fran Ratka, who also serves as GLPA’s Development Chair, will become the new Advertising Coordinator. A review of the advertising rate structure and ad location policy within the journal will also be undertaken.
The 2007 IPS Directory, edited by Chair Dale Smith, was mailed to all IPS members in December 2007. It was distributed in CD format, but was available in print copies to members for purchase at cost. The Directory is also available in the members-only area of the IPS Website. The IPS Directory is published on a biennial basis with updated files available on the website between editions; the next edition will be published in 2009.

The Publications Committee is working with IPS Web Master Alan Gould on the IPS Web Map Project.

Special Publications

The IPS Astronomical Songbook (Jon Bell, Editor) will be distributed in the Planetarian.

Science Communication Masters Theses (Lars Broman, editor), texts of masters theses written by students in the Science Communications program at Dalarna University (Sweden) directed by Lars Broman. To be released in CD format and distributed with a future issue of the Planetarian.

Status of other documents, publications, and efforts:
The Proceedings of the IPS 2006 Melbourne Conference were distributed as a CD set with the 2007 IPS Directory.

The archive of past publications is available as a set of 8 CDs: $75 for members and $175 for non-members.

Dale reported that IPS maintains three repositories of back publications: the U.S. Repository is with Treasurer/Membership Chair Shaun Laatsch; the European Repository is with Chris Janssen at Europolitanium in Genk, Belgium; and the Asian Repository is in Japan at Munakata Yurix Planetarium in Fukuoka prefecture, with Osama Kato. Chair Dale Smith thanked Shoichi Itoh for maintaining the Japanese repository for many years at the Suginami Science Center. Shoi has moved to the National Astronomical Observatory of Japan.

On behalf of Council, Thomas Kraupe acknowledged Chair Dale Smith and his committee for their outstanding efforts on bringing quality and high standards to their work for the membership.

Standing Committee Reports were filed.

Ad Hoc Committee Reports

Ad Hoc Committee Reports were presented, reviewed and discussed. Complete reports will be posted on the IPS Website.

Education Committee

President Susan Button reported that Jack Northrup is the new IPS Education Committee Chair and he will be meeting with his committee during the conference to review the mission and objectives of the committee.

Fulldome Committee

Council discussed the purpose, objectives and future course of the committee. Dan Neafus spoke on behalf of Chair Ryan Wyatt to some of the details in the report. Council will work with the committee to seek ways to collaborate and cooperate in addressing full-dome issues.

History Committee

The IPS History Committee Report was delivered by Historian John Hare. John continues with the task of scanning photographs and slides. He hopes to have a series of thumbnail images available on the IPS Website in the near future. John encourages members to pass on relevant material for the IPS Archives.

International Relations Committee

The IPS International Relations Committee Report was presented by Chair Martin George. Martin reported on the committee’s efforts to reach out to China in setting up a national organization and to continue to encourage other regions to participate in the global community of planetariums. The committee continues to work on the goal of completing the series of translations for the IPS Membership Brochure and resolving some of the issues of translations at conferences. President Elect Tom Mason reported that translations in Polish and Irish have been requested and Chair Martin George added that Chinese and Russian translations have also been mentioned. During early 2008, the Committee gathered a great deal of information about the situation regarding the ongoing closure of the Moscow planetarium and discussed the situation by email. It has been proposed that the Committee recommend to the Officers that a strategy be developed for dealing with IPS responses to planetarium closures and potential closures.

Outreach Committee

IPS Outreach Committee Chair Jon Elvert reported that the emphasis of this committee for the past six months has been collecting and announcing ideas, programs and resources related to the International Year of Astronomy, most of which has been posted to the IPS web site. Council discussed ways IPS could encourage more collaborative events using IYA as a vehicle. President Susan Button, President Elect Tom Mason, Past President IPS International Relations Committee Chair Martin George, RDP Affiliate Representative Thomas Kraupe, and IPS Outreach Chair Jon Elvert will participate in a conference call this week with IYA representatives. The Outreach Committee will continue to pursue ways to more effectively communicate and collaborate with astronomy and space education related agencies, and to improve upon the existing partnerships. Affiliate representatives will be encouraged to become more involved in the distribution of information to their regional members.

Planetary Development Group Committee

President Susan Button reported on behalf of Chair Ken Wilson. The Planetary Development Group Committee continues work on the Planetary Guidebook. Ken reports that the chapter on sound systems and sound studios from Sandro Gomeshas has been reviewed and edited and is back in Sandro’s hands for his approval and possible additions. There is still a need for volunteer authors for the chapters on renovation, special effects/multi-image, and participatory planetaria. Please contact Ken if you are interested in joining the effort.

Portable Planetarium Committee

Chair Susan Button presented the IPS Portable Planetarium Committee Report. Since a new editor for the Planetarian column had not been appointed, Susan will continue to write the column. The Fifth European Meeting of Small and Portable Planetaria will be held Oct. 9-11, 2008 in Portugal, hosted by Navegar Foundation and the Center for Astrophysics of Oporto University. The Committee continues to seek contact people in each regional affiliate and news of their activities for publication in the Planetarian. Affiliates are encouraged to provide information of interest to portable planetariums in regional newsletters and conferences.

Professional Services Committee

Chair Mike Murray reported that the committee has identified several issues that are of interest to planetarians in the digital field: operations and training. His committee will continue to investigate funding sources and methods of addressing some of these topics.

Script Contest Committee

President Susan Button presented the IPS Script Contest Committee report on behalf of Chair Steve Tidye.

The winning script for the 2008 Eugenides Script Contest is Michael Lion, written by Margie Walter, and the runner up is Sky Journey, written by Jiri Holusa. Their prizes will be awarded at the Luncheon during the IPS Awards Ceremony. Chair Steve Tidye will be stepping down as Chair at the end of July 2008. Council discussed how to improve and revitalize the contest. *Manos Kitsonas will work with the new Script Contest Committee Chair to revise the rules and guide.
SciDome and SciDome HD are the ideal choice for your planetarium upgrade. Powered by Starry Night Dome, SciDome is designed to fit the unique needs of educational planetariums. We provide Starry Night’s comprehensive space science curriculum, with elementary, middle and high school lessons for classroom and planetarium education. Now we’re proud to introduce the new SciDome Fulldome Curriculum: complete lessons formatted specifically for the dome, with units for moon phases, seasons, planetary motion, coordinates and more. To learn about SciDome upgrades, and all the features of Starry Night educational products, contact Spitz.
lines for the contest and present it for Council approval.

**Strategic Planning Committee**

Council discussed with Chair Tom Mason of the Strategic Planning Committee what should be the focus of the committee. Tom would like to have a clear consensus from Council on how this information is collected and the issues that are considered by the SPC. Thomas Kraupe said that it should be the task of the committee to come up with the issues to be addressed. Chair Tom Mason reviewed past references to Strategic Planning proposals. Secretary Lee Ann Hennig will forward all correspondence regarding the committee and its reports to the Chair so he can review the history of the issues. A survey of the membership will be designed as an on-line task for the membership to determine which issues are most important to the general membership.

**Technology Committee**

No report submitted

**Website Committee**

Chair Alan Gould reported on the IPS Website Committee activities. The committee is working on implementing an IPS Google Map/Earth. Collaboration with other committees continues with regard to Elections, publications, and posting archival material. The committee will address revisions of IPS brochures, setting up a repository of digital assets for the membership, adding more interesting and current content (graphics, animations, podcasts, and movies). Council discussed the feasibility of conference events coverage, perhaps a virtual conference capability, or should that be a host responsibility. Other ideas included posting keynote speaker/special events, archival conference events on the website.

Shawn Laatsch moved to accept all Ad Hoc Committee Reports, seconded by Donna Pierce and approved by Council.

**Constitution Matters**

Past President Martin George presented his proposals for revisions to the By-Laws and the Standing Rules relating to Affiliate Status. After discussion, the following revisions were approved (changes are in **bold and underlined**).

**Item 1:**

**Revised SR:**

SR.III.A. The organization, in order to maintain its affiliation with the International Planetarium Society, must have on file and/or make available to IPS upon request, a copy of its current membership list and a copy of its mission statement, constitution, or set of by-laws.

**Rationale:** To correct the grammar in the section.

**Item 2:**

**Original SR:**

SR.III.B.1. The minimum number of members of a potential affiliate organization shall be four (4) IPS members each from different institutions/planetariums providing the general geographical region is not currently served by an IPS affiliated organization. (2005)

**Revised SR:**

SR.III.B.1. The minimum number of members of a potential affiliate organization shall be four (4) IPS members each from different institutions/planetariums within the organization’s general geographical region providing the region is not currently served by an IPS affiliated organization. (2005)

**Rationale:** To correct the grammar in the section.

**Item 3:**

**Original SR:**

SR.III.C. Organizations not yet affiliated with the IPS or whose number of members no longer meets applicable minimum affiliation requirements may send a representative to IPS Executive Council meetings, but that representative may not vote and may not receive travel reimbursements from IPS funds.

**Revised SR:**

SR.III.C.3 An Organization accepted as an Affiliate but failing to meet the requirements set out in III.A and III.B may send a representative to IPS Executive Council meetings. However:

a. that representative shall be considered as an observer for the purposes of conducting the meeting;

b. that representative may not vote and may not receive travel reimbursements from IPS funds; and

c. such an organization will, after failing to meet the requirements set out in III.A and III.B for two (2) consecutive Council meetings, have its affiliate status revoked.

**Rationale:** This changes SR.III.C.3 to refer only to an organization that was previously, but is no longer, considered an affiliate, and incorporates SR.III.A. Sub-point (a) clearly states the status of such a person. Sub-point (b) makes it clear that reimbursements and voting are not allowed. Sub-point (c) allows the IPS to remove such an organization from its list of affiliates, so that such an organization
will no longer appear in the *Planetarian* or on the IPS Website. Previously, there was no rule which allowed this to be done. SR.III.D.4 (listed below) allows a non-voting and non-reimbursable person to represent an organization, country or region, but without being considered to be representing an affiliate.

**Item 6:**

**New SR.III.D.4**

SR_III.D.4 Organizations. Independent sovereign states or geographical regions not currently represented by an Affiliate may send a representative to IPS Council meetings, provided that:

(a) that representative or his or her institution is a current member of IPS;
(b) rules 3(a) and 3(b) above apply to such a representative; and
(c) unless representing an independent sovereign state, representation must be made on behalf of at least four (4) IPS members or persons or institutions eligible to become IPS members.

**Rationale:** This additional SR allows countries with even just one IPS member to send a person to represent that country as an observer. This rule allows such a person exposure to the IPS Council and may encourage further membership in the country or region. It also separates the general concept of “defunct” affiliates from that of allowing representatives from non-affiliates, even though “defunct” affiliates may still send a non-voting and non-reimbursable member to Council.

**Original SR:**

SR.III.D.4 A listing of current affiliate organizations is provided in Appendix F, which is updated by the Executive Secretary as necessary. (1997)

**Revised SR: This existing SR becomes SR.III.D.5**

**Rationale:** simple renumbering of the rule because of insertion of the new SR.III.D.4

In other Constitutional matters, Secretary Lee Ann Hennig presented the following By-Laws revisions for Council consideration:

**Item 1:**

**By-Laws: Art.IV.Sec.5**

The Elections Committee shall present the slate of officers to the Membership Committee for ratification and for distribution to the voting membership at least four (4) months before expiration of the term of office or at the beginning of the regular biennial meeting of the membership, whichever occurs first. The voting shall be by signed mailed [POSTAL OR ELECTRONIC] ballot. The candidates with the plurality of votes shall be declared elected and assume office at the designated time. The Chair of the Elections Committee shall receive and count the votes and report to the Officers. The results of the elections shall be announced to the Membership as soon as is convenient.

**Rationale:** This has been addressed in the procedures for elections in the SR’s Appendix B, so to be consistent we need to reflect the advance of technology since the By-Laws were written.

**Item 2:**

**By-Laws: Art.VILSec.2**

A Council Meeting shall be held annually at the discretion of the President in agreement with the Council Members. At any Council Meeting a majority of the Council shall constitute a quorum. All questions arising at Council Meetings shall be decided by simple majority vote except as otherwise provided in these By-Laws. A Council Member may appoint in writing any other member [OF THE SOCIETY] as his/her proxy for Council Meetings, provided the appointed person exercises only one vote by proxy.

**Rationale:** Council has always assumed that any member of the Society, not just another member of Council, can hold a proxy, and Council has always operated that way. The proposed new words incorporate that explicitly.

*Thomas Kraupe moved to approve the revisions to the Standing Rules, Jack Dunn seconded, and Council approved. The By-Laws revisions will be placed on the Fall 2008 Ballot for consideration by the IPS Membership.*

**Unfinished Business**

President Susan Button reviewed the IPS Conference Documents which will improve the planning scope of IPS Conferences.

Past President and International Relations Chair Martin George reported that the MOU template that was originally designed with NASA in mind is available for use with other organizations and will work with Outreach Chair Jon Elvert on implementation.

Council Members were reminded of the importance of access and monitoring of the Yahoo Groups Council Site for IPS information purposes as an additional tool in keeping up with business issues.

**New Business**

Dr. Jacques Guarinos, IPS Media Coordinator, spoke about the mission and goals of this position under the IPS Publications Committee. Jacques sees this as an opportunity to present a global perspective of IPS with respect to astronomical events and to promote the role of IPS in its action on behalf of Astronomy and Planetariums to the world.

Council discussed other ideas concerning related issues which are also common with IPS committees:

a. establishing links among planetariums/events/non-IPS entities
b. providing publicity in other magazines/journals about IPS
c. promoting events on the IPS Website, then linking to the institutions of those events
d. producing position statements similar to the “Age of the Earth” IPS Position Statement
e. encourage members/affiliates/institutions to mention IPS when they are hosting an event
f. providing an accreditation/label for planetariums

g. reminding institutional members to use the IPS Logo
h. providing basic information sheets on the IPS Education Web Page-coordinate these in conjunction with IYA.

President Susan Button will work with Chuck Bueter on looking at options for distribution of the *Let There be Light* planetarium program to IPS members.

IPS Web Committee Chair Alan Gould requested funds for upgrading the server/hard drives for storage of digital assets for the Web Site. *Tom Mason moved to approve the appropriations, Donna Pierce seconded and Council approved.*

Alan inquired again about the possibility of offering joint IPS/Regional Affiliate membership dues. Council discussed the impact of such an arrangement in terms of:

a. how the membership would be discounted
b. the method by which the dues would be recorded
c. offering an e-membership option and its impact on advertising costs in printed versions vs. PDF web-hosted versions of publications
d. complications with accessing web-based memberships
e. the need to still offer mailings and inserts

*The Finance Committee, Publications Chair Dale Smith, and *Planetarian* Editor Sharon Shanks will research this issue to see how such a proposal would affect costs and distribution policy.

**Conference Bids IPS 2012**

IPS 2012 Conference Bids were presented by the following representatives:

Dr. Jacques Guarinos- Saint-Etienne Planetarium, Saint-Etienne, France. The dates for a Saint-Etienne conference would be July 16-22,
Project Reports

IYA 2009 will be celebrated in many venues and in a variety of ways. Council discussed how their regions or institutions were participating in the IYA. Some of the initiatives included special planetarium programs or events related to teacher workshops, co-sponsoring or participating in IYA special events (100 hours of Astronomy, including short (Sminute) trailers about Astronomy in presentations, monthly events/lectures/performances, concerts highlighting astronomy themed music, hosting exhibits/amateur astronomy nights, and many others. IPS members are urged to share their events with the IPS Website Committee and Loris Ramponi for the IPS Calendar.

Shawn Laatsch presented an update on the Ghana Planetarium Project. The planetarium is now installed and well on its way to inspiring audiences with the beauty of astronomy in conjunction with the real sky. Kudos to Dave and his team on a job well done.

For the Good of the Order

President Elect Tom Mason announced that the 2009 IPS Council Meeting will be held in Toulouse, France—dates still to be determined.

Council expressed its gratitude to Shoichi Itoh for the many years of service he has given to IPS both as a Council Representative for the Japan Planetarium Association and other efforts on behalf of the planetarium community. Shoi has changed jobs and now works at the National Astronomical Observatory of Japan. With business completed, Donna Pierce moved to adjourn the meeting, seconded by Shawn Laatsch, and approved by Council.

Call for Nominations

Lars Broman, Award Committee chair
Lbr@teknoland.se

The International Planetarium Society recognizes outstanding service to its organization once every two years. The next time recognition will be bestowed will be in 2010, during the conference in Alexandria, Egypt.

It is the task of the Awards Committee to prepare the background material from which the IPS Council can decide which persons will receive awards and which will be named Fellows of IPS. It is a rather long process, since Council meets a year in advance of the conference to make these decisions and needs the information by the summer of 2009.

Therefore, now is the time to nominate! Your nominations should reach the Awards Committee no later than 15 May 2009 so we can prepare a recommendation for Council’s decision. You can send your nomination to any of the Award Committee members:

Jeanne Bishop, jeanneebishop@wowway.com;
Thomas Kraupe, thomas.kraupe@planetarium-hamburg.de; and
Lars Broman, Lbr@teknoland.se.

Please include the reasons why you think your nominee should be awarded or named a Fellow.

IPS has two kinds of awards. First is the classic IPS Service Award, on which our Standing Rules say: An IPS Service Award shall be bestowed, from time to time, by the Society upon an individual or institution whose presence and work in the planetarium field has been, through the years, an inspiration to the profession and its members. Between 1982 and 2008, 20 service awards have been given.

The second award is the IPS Technology and Innovation Award which, according to the Standing Rules, shall be bestowed, from time to time, by the Society upon an individual, institution or commercial vendor whose technology and/or innovations in the planetarium field have been, through the years, utilized or replicated by other members and/or planetariums. This is a new award and it has so far been given only once, in 2008.

Deserving members of IPS can be named IPS Fellows. In order to be named a Fellow of IPS, the Standing Rules say that a member must have continuous active membership in good standing in IPS for at least five years and substantial contributions in at least two of the following: (1) Serving IPS in elective office, diligent and/or devoted committee work, and the organization of conferences and meetings. (2) Relevant and significant publications and/or conference presentations. (3) Cooperation with professional societies, organizations and groups which bring attention to the importance of planetariums’ existence. (4) The development of new methods in the planetarium field.

Since the mid-1980s, 218 IPS members have been named Fellows of IPS. The names of previous Awardees and Fellows are found at www.ips-planetarium.org/awardees.html. The complete rules are found on page 16 in IPS Bylaws and Standing Rules, www.ips-planetarium.org/or/rules.

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Respectfully submitted,

Lee Ann A. Hennig
Executive Secretary, IPS
June 27, 2008

★★★★

*Addendum to the Minutes:
At the General Membership Meeting, Mark Rigby of the Sir Thomas Brisbane Planetarium, Brisbane, Queensland, Australia was nominated for the office of President Elect of IPS. His name will be placed on the ballot for the election of officers in October.
The subject matter for the 2007 IPS/Eugenides scriptwriting competition was Constellations. Jiri Holuša really took this to heart and produced what may be the mother of all constellation shows in his script *Sky Journey*. And what a journey it is! If you present Jiri’s script in full, I suggest you make sure your pointer’s battery is fully charged, as it will be worked overtime.

It was a great pleasure for me to read such a gloriously “old-fashioned” script that centers completely and unashamedly around the one thing that planetariums show better than anything else—the star field. I’ve never seen so many point outs in one show, but that’s great because it reminds both us and the audience why humanity has always had such a fascination with the universe. Jiri’s script is a thoroughly deserving Second Place winning script, and I hope the simplicity of its central idea, and its ease of reading, will encourage you to try your hand, too, at producing a script for the next competition.

Steve Tidey  
Chair, Script Contest Committee

**GOALS:**

- Teach the basic constellations and asterisms visible from the latitude 50° N
- Explain the difference between a constellation and an asterism
- Show that different cultures have different constellations and that constellations are inventions of human imagination
Hello… Welcome to the (name of) Planetarium. The room we are in now is called the sky theater. It is an interesting place. It’s basically a big circle, and when you look up, you’ll notice a big dome above you. Its diameter is ……. meters. And this dome has an important purpose here. It serves as a projection screen for starry skies.

But in order to have a starry sky projection, we need a projector. As you might have guessed already, the projector we’re speaking about is the instrument here in the middle of the theater. It can project about 3500 stars onto the dome above us at once. This is roughly the same number of stars you can see outside in the real sky, too, providing there are good observation conditions.

But, these days, ideal observation conditions are rather rare. You won’t find them in cities or towns, or even in their surroundings … there is just too much light from humans around. But you will find excellent observation condition in mountains or deserts, where humans don’t live and the air is dry. Maybe you have already been in these environments and have experienced a really dark sky, and been in awe of the multitudes of stars shining above you… Maybe this experience is still awaiting you. However, whatever your experience is, we can create a simulation of a really dark sky here at the sky theatre. Here, you can taste what a really dark sky looks like without having to travel to far away places.

And the sky theater can offer you even more. You can take a journey here throughout the year and learn some of the best known constellations in the sky. If you pay close attention, I guarantee that you will be able to find some of them on your own in the real sky, and even show them to your friends! So, if you are ready for some fun, let’s start our sky journey, OK? Watch out, it’s starting to get dark…

So, it is dark enough for us to see some stars above us now. But, there is also a city on the horizon. The city is full of lights. And now let’s see what happens when the city lights dim… Yeah, we see many more stars … Wow, isn’t the starry sky marvelous? …

Now, where can we even begin in this celestial labyrinth? For better orientation, astronomers have divided the sky into areas that we call constellations. And we will learn about some of them today. I suspect that you might even know a few of them by name already. Today, I’d like to have some fun with you finding them in the sky. Let’s start with one of the best known groups of stars… If you look way up, you’ll find it very high in the sky… Does anyone know what it is called? Yes, that’s right, it’s the Big Dipper. The Big Dipper consists of seven bright
Big Dipper outline – off

light pointer as indicated throughout in text

Big Dipper and Little Dipper outlines – on

north celestial pole – on

compass rose – on

north celestial pole – off

| stars… one, two, three, four, five, six, seven… Excellent. The tetragon represents the bowl and the remaining three stars depict the handle. Great. |
| But, what about the Little Dipper? It is not so clearly visible. Nevertheless, it does contain one very famous star. This star is not particularly bright, but because the stars around it are much fainter, it is actually quite discernable. The name of this star is … Polaris. So how can we find it? |
| First, we need to find the Big Dipper. Then, we need to locate two stars at the pouring side of the bowl. They are here. Good. Those two stars are sometimes called Pointers, because they point to the famous star we are seeking. Just follow the Pointers upwards and the first star you run into is Polaris, the brightest star of the Little Dipper. Here is its handle and here is its bowl. |
| Now you can see that the Little Dipper and the Big Dipper pour into each other. Well, you may ask yourself why the brightest star of the Little Dipper is called Polaris. The answer is: because it is the star that is nearest to the North Celestial Pole. |
| Now you may ask what the heck the North Celestial Pole is. Let me explain this to you this way: if you stood at the North Pole of the Earth, the North Celestial Pole would be exactly above your head. And Polaris would be the nearest star to the North Celestial Pole. |
| Polaris is also called the North Star, because whenever you find Polaris in the sky, you can easily tell which way is north. Of course, the opposite side is the south. When you face south, the east is on your left, and the west is on your right. So knowing this about Polaris can be very practical, whether you are a Viking at sea, crossing the desert on your camel, or simply finding your way home at night some time. |
| Now, before I continue, there is something important you need know. Neither the Big Dipper nor the Little Dipper is a constellation – they are just groups of stars that belong to the constellations of the Great Bear and the Little Bear. So let’s have a look at them. |
| Look here, at the upper side of the cup. This is the back of the bear, and those three stars to the right represent his head. His front leg has sharp claws, those less bright stars represent his belly, here we have his hind leg with claws, and the handle of the Big Dipper makes up the Great Bear’s tail. So this is the constellation of the Great Bear, which contains a group of stars called the Big Dipper. Such distinctive groups of stars, which are not defined as constellations, are asterisms. |
So you have been with me for only 5 minutes and you already know two asterisms: the Big Dipper and the Little Dipper, and that those two asterisms are parts of two constellations: the Big Bear, and the Little Bear, which is this area here, around the Little Dipper…

And now, let’s continue on our sky journey. Are there any other asterisms in the sky? Of course there are. There is an asterism called the Spring Triangle. It is called so because it is visible during the spring just after sunset.

The three bright stars that form the Spring Triangle belong to three different constellations: the Lion, the Herdsman, and the Maiden. Let’s examine the Lion first. Its brightest star is Regulus. One can find it easily using two stars of the Big Dipper. Here is the Big Dipper and when you follow the line connecting two back stars of its bowl downward, you cannot miss Regulus.

Regulus belongs to another asterism, the Sickle. This asterism also looks like a reverse question mark. And now imagine the Lion. The blade of the Sickle represents the mane of the Lion. Regulus is its heart and the stars to the east represent its flank and tail. The Lion is a really beautiful spring constellation.

Now we can go to the next star of the Spring Triangle. Its name is Arcturus. We can easily find it again through the help of the Big Dipper. Just follow the arc of the handle of the Big Dipper and you cannot miss Arcturus, the brightest star of the Herdsman. The star pattern of the Herdsman can be viewed as a boy’s great kite.

And now the last star of the Southern Triangle. We can locate it easily in a similar way as Arcturus. Just follow the arc of the handle of the Big Dipper and continue beyond Arcturus. The next bright star you will bump into is Spica, the brightest star of the constellation of the Maiden. Its star pattern resembles a lazy letter Y.

All three constellations, the Maiden, the Herdsman and the Lion, are quite large. In fact, they belong among the largest constellations of the sky. But you can also find nice small constellations in the spring sky. Below the Maiden is the constellation of the Crow, which is shaped in a sort of trapezium. The two highest stars of the trapezium can serve as pointers toward Spica. Another small constellation we can find in the spring sky is just east of the Herdsman. It is the Northern Crown, whose main stars form a semicircular arc. One star of this arc outshines all the others; it is called Gemma or the Gem Star.
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AM ESO announces information about exoplanet Gliese 581 c.

PM The world reads descriptions about Gliese 581 c.

The orbit of Gliese 581 c may be within the habitable zone, the area where the heat from nearby star Gliese 581 is able to provide liquid water.

AM In California, Paul Buehler updates his definiti theater with a file from Sky-Skan.

PM Glendale Community College Planetarium students experience Gliese 581 c.

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Paul Buehler, Glendale Community College Planetarium
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<table>
<thead>
<tr>
<th>diurnal motion starts</th>
<th>So that’s probably enough said about the spring sky. Now, let us look at the summer sky instead. The Lion is slowly setting in the west. The Great Bear is getting lower in the sky and new stars and new constellations rise in the east.</th>
</tr>
</thead>
<tbody>
<tr>
<td>constellation outlines – off</td>
<td>What we see now is the starry sky of summer evenings. Where can we start here? There is a distinct asterism in the sky called the Summer Triangle. Can you find it in the sky? Try it... It consists of three bright stars... The brightest of them is Vega. The other two stars are called Deneb and Altair.</td>
</tr>
<tr>
<td>diurnal motion ends</td>
<td>Vega is almost directly overhead. It is the brightest star in the summer sky and belongs to the constellation of the Lyre. Deneb belongs to the constellation of the Swan. The Swan is also known as the Northern Cross, as the pattern of its stars suggests. Altair, the brightest star of the constellation of the Eagle, forms the southern end of the Summer Triangle. Under the Swan’s wing lie the stars of the prettiest small constellation in the sky – the Dolphin.</td>
</tr>
<tr>
<td>diurnal motion starts</td>
<td>When the summer nights become longer and autumn is approaching, the Eagle, the Dolphin, the Swan and the Lyre swing slowly westward across the sky towards the horizon. The Eagle sets tail first, followed closely by the Swan, who dives beak first below the western horizon.</td>
</tr>
<tr>
<td>constellation outlines – off</td>
<td>As nights get colder, we can discern a new asterism in the sky. It is called the Great Square of Pegasus and signals the coming of Autumn. Not far from the Great Square of Pegasus is the constellation of Cassiopeia. The five brightest stars of this constellation form the letter W. Again, the Big Dipper can help you find this constellation easily. But where is the Big Dipper at this time of year?</td>
</tr>
<tr>
<td>diurnal motion ends</td>
<td>Well, during autumn, the Big Dipper is very low above the northern horizon. Now, find the Big Dipper’s pointers, and then trace an imaginary line from them to Polaris, the brightest star of the Little Dipper. And now look on the opposite site of the Little Dipper from the Big Dipper. At an equal distance from the Little Dipper is Cassiopeia, the Ethiopian queen. And there is another aid here: a line drawn from Polaris through west end of Cassiopeia hits a large, nearly perfect square of four stars, the Great Square of Pegasus that we just saw. But as I mentioned before, the Great Square of Pegasus is not a constellation, it is just an asterism.</td>
</tr>
<tr>
<td>constellation outlines – on</td>
<td>The star in the upper-left corner of this asterism belongs to the constellation of Andromeda. Andromeda was an Ethiopian princess, daughter of Queen Cassiopeia, and is represented by a line of three bright stars. If you continue along this line, you will</td>
</tr>
</tbody>
</table>
encounter an arc of stars, which belongs to the constellation of Perseus. Perseus was a famous Greek hero who slew the head of dangerous Medusa. The eye of the Medusa is represented by the star Algol.

When you look at the Great Square of Pegasus, at Andromeda, and at Algol in Perseus, you can notice a star pattern similar to the enlarged asterism of the Big Dipper. The Great Square of Pegasus forms the bowl, while the stars of Andromeda and the star Algol of Perseus depict the handle.

Another constellation that we can locate relatively easily is Cepheus, the Ethiopian king. Its star pattern can remind you of a house or throne. The star at the top of the house can be easily found if you draw an imaginary line from Pointers through Polaris and continue a little beyond. Cepheus, the Ethiopian king, is next to Cassiopeia, the Ethiopian queen. They are the only husband-and-wife couple among the constellations. There is a fun story about them and other figures of the autumn sky.

But first, there is one more constellation that you need to know about. It’s called the Sea Monster... it’s rather low above the horizon and although its stars are not particularly bright, it plays an important role in our story....

Cassiopeia was a very beautiful Ethiopian queen, but she was also vain and boastful. One day she dared to claim that she was more beautiful than the Nereids, the sea nymphs, who were renowned for their exquisite beauty. The Nereids complained to Poseidon, the God of the Seas. Poseidon, infuriated, sent a terrible sea monster to ravage the Ethiopian coast. At unexpected moments, this sea monster appeared from the waves at the Ethiopian coast to devour people and their herds. Dismayed at the destruction, King Cepheus consulted the oracle of Ammon to see what could be done to rid his country of this plague. It is hardly surprising that Cepheus’ heart was filled with horror when he learned that the land could only be saved if he were to sacrifice his daughter, Andromeda, to the monster. As king, he had no alternative but to save his people, even at the cost of losing his own daughter.

Thus Andromeda was led to the water’s edge where she was chained to a rock and left to the mercy of the monster. At this moment, the hero, Perseus, was passing by and was immediately captivated by the beauty of the young chained woman. He learned why she was chained there and decided to rescue her. When the sea monster appeared among the waves and began to approach the coast, Perseus swooped down and tried to kill the monster with his sword. After a long fierce battle he found out that it is not possible to kill it in this way. Therefore he pulled
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| recorded narration ends | Medusa’s head out of his leather bag and dangled it in front of the sea monster. The monster instantly turned to rock, as was the fate of anybody who looked at Medusa. Perseus then freed Andromeda from her chains and took her as his bride. |
| live segment            | Historians believe the plot of this story is very old and might have originated in ancient Mesopotamia, which was located where today’s Iraq is found. Historians also believe that the oldest constellations we recognize today in the sky come from the same territory. So the origins of some of our constellations are really very old. |
|                         | I think it’s time to move toward the next season. As winter approaches, the Great Square of Pegasus descends toward the western horizon and new constellations appear in the east... |
| constellations outlines – off | The best known among them is the constellation of Orion. Its pattern of stars is one of the most recognizable in the sky. Three stars in a row make up the Orion's belt, which is within a rectangle of four bright stars representing his shoulders and feet. |
| diurnal motion starts    | Orion is a hunter, so many animals are around him. We can find two of them using Orion's belt. If you draw a line through the belt and continue downwards, the line will lead to the brightest star in the sky – Sirius, the eye of the Greater Dog. |
| diurnal motion ends      | If you draw a line through the belt and continue upwards, it will take you to the reddish star Aldebaran, the fiery eye of the Bull. The head of the bull is depicted by a V-shaped group of stars. Two bright stars, that represent the tips of the Bull’s horns, and the star Aldebaran, representing the Bull’s eye, form another, much bigger letter V. The back of the Bull is embellished by a group of stars called Pleiades. They are again roughly on the line of Orion’s belt. |
| constellation outlines – on | The arc of Perseus leads to Pleiades too. High in the sky, above the horns of the Bull, is the star Capella. Again, the Big Dipper can help us find it. An imaginary line drawn from the top stars of its bowl points to Capella, which belongs to the constellation of the Charioteer. Its star pattern looks like a horseshoe, if we include the star marking the tip of the Bull’s horn. |
| constellation outlines – off | Another winter constellation is called the Twins. The outline of this constellation is nearly a perfect rectangle, where each long side of the rectangle represents one of the Twins. The brightest stars of the Twins are called Castor and Pollux, to commemorate the twin brothers from the Greek myths. Castor is closer to Capella, while Pollux is closer to another bright star, Procyon. Procyon is the only bright star of the constellation of the Lesser Dog. |
| constellation outlines – on | |
| constellation outlines – off | |
Too many new constellations? Well, there is an aid – it is an asterism which has the shape of the letter G. We can begin with the star Aldebaran from the constellation of the Bull; then we continue toward Capella in the Charioteer; after that, we go toward Castor and Pollux in the Twins; our next stop is Procyon in the Lesser Dog; then the brightest star in the sky, Sirius, which belongs to the Greater Dog; and finally, we finish the letter G with three stars from the constellation of Orion. In this way, the asterism of the letter G can help us identify the brightest stars and their constellations on the winter sky.

When the winter is long and cold, we eagerly await the arrival of spring. So, look at the eastern side of the sky. The Big Dipper is slowly getting higher and higher until it is almost directly above our heads... This is the sky we already talked about – it is the spring sky. Lower in the south is the Spring Triangle.

Now, as we journeyed throughout the year in the sky, we could see some constellations all year round. Can you name any of them? Yes, we could see the Great Bear, probably the best known constellation of all. So how come it is visible throughout the year? Well, this is because the Great Bear is close to Polaris.

When you look in the sky, you see just now that it rotates around Polaris. The constellations that are close enough to Polaris stay above the horizon all the time – they never set and never rise. We call these constellations circumpolar. Among circumpolar constellations, there are the Great Bear, the Lesser Bear, Cassiopeia, and Cepheus.

Oh, to see them comfortably, we should face north. Here, in the planetarium, we can do it easily. We can put north here just ahead of you. All we need to do is to rotate the star projector. Are you ready for the change? OK, let’s go…

So now we’re facing north and can easily identify the circumpolar constellations: the Great Bear, the Lesser Bear, Cassiopeia, and Cepheus. You know, it’s not only modern astronomers that are aware of the circumpolarity of those constellations.

Native Americans have several sky stories that are based on circumpolarity, as well. One of the most splendid comes from the Iroquois and Micmac of the northeastern part of North America. To these people, the bowl of the Big Dipper represents a bear that is being hunted by seven Indians. All of these hunters have bird names: Robin, Chickadee, Moose Bird, Pigeon, Blue Jay, Owl and Saw-Whet. Just for your information: today’s astronomers place the last four stars into the constellation of the Herdsman and call the brightest of them Arcturus.
| Indian music picture – off | And now, look more closely at the Chickadee, the second hunter. There are actually two stars there, not one. The second star represents a pot, in which the bear will be cooked when it is finally killed. Not far from the hunters is a small arc of stars which modern astronomers call the Northern Crown. But Iroquois and Micmac call this constellation the Bear’s Den. And this is the place where our story begins: |
| recorded narration starts | In the spring, when it gets warmer, the bear wakes up from hibernation and leaves his den. The hunt begins: all seven Indians start pursuing the bear. Nevertheless, the bear successfully escapes from them all summer long. As autumn approaches, the bear slowly descends toward the northern horizon, while the last four hunters are disappearing below it. They are so exhausted that they have given up the pursuit. This leaves only the three foremost hunters – Robin, Chickadee, and Moose Bird – to continue the hunt. |
| diurnal motion starts | When the bear attempts to stand on his hind legs, the hunter called Robin finally hits the bear with an arrow. The fatally wounded bear sprays blood onto Robin. Robin then shakes himself and thereby colors the leaves of trees blood-red. Because this happens every autumn, every autumn the forests turn red. And because a little bit of blood remains on Robin’s breast, the Robin got its name Redbreast. |
| recorded narration ends | The killed bear is then cooked in the pot carried by the second hunter. After the bear has been eaten, only its skeleton remains in the sky. It lies on its back as it moves up in the winter sky. The following spring, another bear leaves the den and the hunting scene is reenacted. In this way, the Native Americans have linked together, in a splendid myth, cyclical celestial phenomena and the cyclical events of nature around them. |
| diurnal motion ends | Different human cultures have developed different celestial lores. Where Native Americans see a bear and our culture imagines the Big Dipper, other nations see in this part of sky those objects that are close to them. So the people of North Africa see a camel there, Inuit know this star pattern as the Kayak Stool and Reindeer, Ostyaks from Siberia see a Moose, in the United Kingdom this pattern is known as the Plough, and in Central Europe as the Great Wagon. |
| compass rose – off | So constellations are not the products of nature, they are the inventions of human imagination. |
| live segment picture: the star pattern of the Big Dipper and the outline of the Big Dipper | |
| outline of the Big Dipper – off | |
| outlines of constellations of other cultures are projected onto the star pattern of the Big Dipper | |
Stars in constellations are at different distances and are not usually physically bounded. Because modern astronomers need to be accurate in their work, they divided the sky into 88 precisely defined areas that are called constellations. It is like land that is divided into countries and states. So it is the area around the star pattern that makes the modern official constellation, not the star pattern itself.

As we journeyed around the sky, we dealt with the star patterns of official astronomical constellations. And we also mentioned some common asterisms that helped us get around the sky. But at the end of our sky journey we visited other cultures and discovered what they saw in the sky. The sky is extremely rich with human imagination.

As we finish up with our presentation here, it might be time for you to get your own celestial map and try to find the constellations in the real sky all by yourself. Learn just a few constellations at first, and step by step, you can add others. And then you can even teach your friends or parents how to recognize them. If you have any questions, you can always come back at the (the name of) planetarium to find out more. So have a great time on your very own sky journeys!

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Not even curiosity can escape.
President’s Message

This month I received another email confirming that the National Center for Science Education mentioned us in their newsletter. Jason reported, “This message went to thousands of people today and will be reposted on blogs and teacher support websites all over the world. Your statement and website should see widespread exposure from this. I told you NCSE would be pleased, Jason.”

Evolution Position Paper

I recently attended a lecture sponsored by the Technology Alliance of Central New York (TACNY), given by Dr. Jason R. Wiles of the departments of Biology and Science Teaching at Syracuse University near my home.

The lecture described his journey from being raised in a family and church that taught him a literal interpretation of the Bible to his acceptance of evolution. Jason took us step by step through his higher education experience and how his mind was changed.

Afterwards I expressed my appreciation of his lecture and also mentioned the IPS position paper, “The Ancient Age of the Earth and Universe” and gave him my card.

Later he emailed me and asked for the address for the statement on our website (it’s at www.ips-planetarium.org/pubs/age-of-universe.html).

He replied, “Awesome. Thanks. I’ve sent the URL along to the folks at the National Center for Science Education, and they are more than pleased with the statement. They will be adding it to their Voices for Evolution page (www.ncseweb.org/article.asp?category=2). I’m not sure whether they will log it as a statement from a scientific/scholarly organization (like the American Association for the Advancement of Science and the American Astronomical Society) or an educational organization (like the National Science Teachers Association, the American Association of Physics Teachers, or various museums on this list).

“Either way, your organization will be in good company and a valuable addition to the list. Now that it will be on the “Voices” list, and the NCSE (the organization at the front line of nearly all evolution education battles) knows about it, my guess is that your statement will be one of the first items referred to if any planetarium, member or not, is challenged by pseudo-scientific and/or religious intrusion into science education. Good show! Thanks again, and let me know if I can ever be of service to you, TACNY, or IPS. Jason.”

So, lesson learned. I recently attended a lecture sponsored by the Technology Alliance of Central New York (TACNY), given by Dr. Jason R. Wiles of the departments of Biology and Science Teaching at Syracuse University near my home.

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Political Rhetoric

As I write this column, a team of IPS members and IPS Media Coordinator Jacques Gua-rinos are developing a statement that addresses the comments of U.S. Senator John McCain, a candidate for president of the United States in November’s election. His denigration of planetariums as “foolishness” presented an opportunity not to be missed. IPS will seize this opportunity to raise public awareness of planetariums and their value to society! It is not the place of IPS to comment on the politics of any country or to promote any candidate, but do have an obligation to correct the record if planetariums are demeaned in any way. Hopefully we will increase the profile of planetariums in some way by avail-ing ourselves of this occasion to speak out.

The International Year of Astronomy 2009 is Upon Us

Do not forget to visit our IPS web page for the IPS Outreach Committee’s latest news about IYA 2009 (www.ips-planetarium.org/or/comms/outreachcom.html). During the latest conference call of the IPS Working Group, under the direction of Peter Michaud, we discussed the “100 Hours of Astronomy” initiative. This is a cornerstone project for IYA 2009. For April 2-5, is a round-the-clock, worldwide event with 100 continuous hours of a wide range of public outreach. For more details go to www.astronomy2009.org. A suggestion: have a parallel opening event for 100 Hours of Astronomy at your science center/planetarium.

Members of the IPS Working Group discussed the following interesting suggestions for complimentary initiatives and extending the impact of IYA throughout the year:

- Explore making presentations and observing sessions in unusual settings, such as hospitals, bus/train stations, airports, other museums (such as Greek and Roman sky stories at an art museum), shopping malls or outdoor parks/plazas in a neighborhood;
- Take advantage of morning dark hours for
“Bus Stop Astronomy.” Children waiting for school buses have a several minutes to notice and enjoy the morning sky with your help.

- Network with local community colleges, universities and observatories;
- Network with libraries by initiating community reading programs, through which age-appropriate books are selected and read, followed by get-togethers where people can discuss the book(s);
- Involve families, like through a monthly community night (work with church and community groups can have a monthly astronomy theme). During these nights you could conduct scavenger hunts, tell stories, and invite community members to bring their questions and receive discounted admission or tee shirt as a reward. Play games or pose questions such as: “How many products can you name that have an astronomical reference?” Hold a planetarium astronomy quiz program. Suggestions for family programs can be found at NASA sites, and activity kits are available from the Astronomy2009.org; and activities sponsored by Astronomers without Borders (www.astronomerswithoutborders.org);
- Invite community members to bring their telescopes for an observing night, or hold clinics for people to learn how telescopes work, how to by one and/or how to use the one they already have;
- Pair up with your local observatory or amateur astronomy group for local speakers;
- Obtain and show programs designed for the occasion, such as Two Small Pieces of Glass; Let There Be Night; and The Quest of Our Cosmic Origins.
- Use the IYA2009 trailer in your dome and museum; see www.astronomy2009.org.
- Remember to inform others about your activities. Some avenues for communication of IYA and 100 Hour events at your location include: The Planetarian and IPS website; Electronic sites, including IPS News, Dome-L, groups.yahoo.com/group/full dome, the Planetarium Network (planetarium.ning.com), and the IYA website.

Conference 2010

The 20th International Planetarium Society Conference (IPS 2010) will be held at the Planetarium Science Center at the Library of Alexandria in Egypt, 26-30 June 2010.

The conference website is up and running; make sure to visit it often as plans for our next meeting develop. Go to the IPS website for a link, or go directly to www.bibalex.org/IPS2010/home/home.aspx.

Some Final Words

My dear colleague and mentor, Martin George, I cannot thank you enough for the wisdom and guidance I received from you during the last four years. As president, you were a shining example of what IPS needs in a president and as past president, you continued to serve me and our members well. Thank you for being my right hand as you spread the good word of IPS during your extensive travels.

Thank you also for initiating and writing your Past President’s Message. It is a wonderful addition to our journal. However, I will not continue that column since I am already able to present news in the Mobile News column and I will also keep our new president posted on any news I have for the general membership through his column. I do invite you to continue with your excellent column, only under another name, perhaps something like the International Relations Report. We certainly look forward to all the news you can share on that front.

Lee Ann and Shawn: I absolutely would not have been able to succeed in my work during this presidency without the both of you. You are and have been, for so many years, essential in helping IPS provide the services that are so important to our members. I appreciate how much effort and perseverance it takes to hold the positions that you do. Thank You!

And, finally, this is the time when I am delighted to say that we are in for a real treat over the next two years under the presidency of Dr. Thomas Mason! I am truly looking forward to his term of office and you should be too. He has been exceedingly helpful during my presidency. During Council meetings he was ever alert and at my elbow, offering to assist me with some task. It was as if he could read my mind and accurately anticipate the assistance I would need every time! IPS members are sure to benefit from the attributes, knowledge, and experience of Tom Mason. Congratulations Tom, and I hope I can be an effective assistant during your presidency.
CHIRON – son of CHRONOS

According to Greek mythology, CHIRON was a Centaur – half man and half horse – a true hybrid! CHIRON was the son of CHRONOS, and is legendary for his wisdom, his ability to teach, and in the end – his immortality in the shape of the southern constellation Sagittarius. GOTO INC is now proud to announce that we have now named our newest projector, the CHIRON HYBRID Planetarium™!

CHIRON truly is the son of CHRONOS, the landmark planetarium projector created from user input, and which revolutionized the industry over the past 5 years. It shares the exact same control console and system as the CHRONOS HYBRID, including all of the ergonomically designed features allowing ultimate ease of use.

CHIRON is GOTO’s first projector built from the ground up to be a HYBRID. That means we designed in the excellence and beautiful sky of our finest opto-mechanical starfield projectors. But it also means that we designed OUT all projections which could be done well by the synchronized digital video system. The end result is lower cost, smaller size, and unequaled performance in 15-30 meter domes.

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Please welcome CHIRON, the newest member of the GOTO family of planetariums, and contact us if we can answer questions about how to include a CHIRON HYBRID Planetarium™ in your planning.
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Past President’s Message

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When I accepted the nomination for IPS president in 2002, having six years ahead of me as an IPS Officer seemed like a very long time. Now, as 2008 draws to a close, I find myself reflecting on what seems to have been a very fast six years, my life in astronomy, and on our profession and where it is heading.

The most important part, to me, of being an IPS officer has been the ability to interact more than ever before with the people of our profession—people all over the world who devote their lives to the cause of promoting astronomy and space science through the medium of the planetarium.

It’s All About Devotion

And it is, indeed, devotion. We don’t make great fortunes by working in our domes and proudly giving our audiences an experience to remember, or by all of the other background work we do that keeps our planetariums going.

We do, however, enrich our own lives as we enrich the lives of other people.

And we are lucky, because the vast majority of planetarium professionals are doing what they do because they love their work. We love the night sky, and we love keeping track of all that is happening in astronomy and space research and passing it on in ways which can be understood by everybody, of all ages—especially to young people, some of whom will become tomorrow’s scientists.

My life in astronomy started when I was six. My parents and I then lived in a flat in an inner suburb of Hobart, in Tasmania. I used to look out of my bedroom window at the stars, wondering about them. I remember my mother telling me that the light from the stars took years, or even thousands of years, to reach us, and I thought that was fascinating.

I noticed that the stars moved across the sky during the night, but wondered if they also moved in relation to each other. I drew a chart of part of the sky—I think it may have been part of Scorpius—and checked from night to night to see whether the pattern was changing. Of course it wasn’t, and so I began learning more about the constellations. Sadly, that little chart I drew is long lost.

Name Dropping Errol Flynn

I went to the same primary school as Errol Flynn (although not at the same time). This is not at all significant, except for the fact that a number of people with some knowledge of the famous actor were aware that he once lived in Tasmania. In our school was, of course, an Australian flag, which includes the Southern Cross. One day I suddenly realised that I had not yet identified the Cross, and dearly wanted to have a picture of our flag so that I could take it out with me at night. It was old Mr Barlow, who used to run the grocer’s shop at the end of the street, who came to the rescue for me, and that very night I was able to find the smallest constellation of all.

I had many of my schoolmates fascinated with the sky too, and when I was given my first telescope, many of them wanted to look through it to see such things as the craters on the Moon and the rings of Saturn.

I found that I really enjoyed speaking to others about the night sky and the things I was seeing and experiencing, and this continued right through my high school days. I naturally became very involved with the Astronomical Society of Tasmania—the state-wide amateur group—and found myself being elected president at the tender age of 17.

Within a few years the society began running public astronomy nights with members’ telescopes, and I found that my favourite activity was talking about the night sky to the lines of people who were waiting for their views, entertaining them so that they were not too bored with the wait.

By this stage I was part way through a PhD, but I have to admit that I found that the thrill of speaking to the media and groups of people about astronomy was a far greater one than dealing with the mathematics of nonradial pulsations of variable stars.

It was pretty obvious to me that working in a planetarium would, therefore, suit me very well and when such a position came up in Tasmania, I simply couldn’t resist applying!

Our Work and Our Passion

The main reason I have been reflecting on all of this recently is that, as I have mentioned above, we are lucky to be doing something that is our interest or, in many cases, our passion. Some of my friends and colleagues find it amazing that I choose to spend much of my own leave time visiting planetariums or observatories in other countries, but my feeling is that those people can have their beach resorts with the expensive cocktails by the pool, while I follow my lifelong interest of interest!

I also reflect on the enormous work we planetarians do, and will continue to do, in order to try to halt, and reverse, what I see as a trend towards scientific illiteracy around the world. I am personally deeply concerned that the world is heading for a crisis: the proportion of people with adequate grounding in science and the more basic skills of numeracy and literacy appears to be dropping.

At the risk of offending some educational institutions and policymakers, I have seen educational systems at most levels changing, in my opinion, for the worse. It is far less common today in Australia, for example, to find physics and chemistry being taught as separate subjects at the high school level as it was when I was in my third and fourth year of high school myself (when I was 14 and 15 years old).

I am sure that I am not alone in my thoughts. Take, for example, the highly respected British magazine New Scientist, which has run articles recently commenting on the problem of scientific illiteracy. To make matters worse, in Britain the financial viability of science centres is coming into question—a fact that was brought to my attention by our colleague Dr Glen Moore from Wollongong, Australia, at this year’s Australasian Planetarium Society Meeting. It is a problem, or a potential problem, about which we should all be aware in our own countries, too.

We cannot, of course, easily measure the benefits of our science centres and planetariums in terms of a balance sheet! We planetarians and other science centre professionals know (not just suspect, in my opinion) that we inspire people and engender interest in science. That can only benefit a country (and the world). I am quite certain that our institutions have an increasingly important role in scientific progress.
There is no question about it: astronomy is a key to getting people interested in science. And the planetarium environment allows for people to have an astronomy expert physically present—someone of whom questions can be asked, and someone who can inspire.

Yes, I've said those kinds of things before, but it is something about which I am quite passionate!

To some of you, I may have come over sometimes as an "old school" planetarian. The truth is that I am always very keen to embrace new developments, although I unashamedly continue to be influenced by my opinions about what a planetarium should be setting out to achieve.

We Are in Transition

If I were to encapsulate my thoughts about the changes we are seeing in our profession, I would have to say that we are in a transition period between domes being built specifically for the planetarium purpose, and domes being used for a variety of purposes, one of which is as a planetarium.

That in itself is not something about which I feel strongly negative, provided that the "alternatives" put the dome to good use. Yes, financially, running such things as music-laser shows can be a great idea; in addition, our domes are especially useful for visualisation of scientific phenomena outside of astronomy.

I do think we need to be careful, however, to keep astronomy as a major topic in our domes, and to ensure that the quality of the shows and the associated interaction with planetarians is maintained. It is a matter of keeping up a standard.

I have often commented about digital systems producing a less-than-realistic night sky, a fact with which nobody can argue, including those who sell them. But I am not against digital systems at all, nor am I against fulldome video shows on our domes. But we must remember that whatever projection system we use, it is just a tool. We run it—it does not run us!

Yes, I am looking forward to seeing the developments to come in digital systems. I remain passionate about the wonderful starfields produced by optomechanical projectors, but the digital ones are going from strength to strength. As a very significant example, I was especially delighted at the Technology Award given to Steve Savage at the 2008 IPS Conference in Chicago.

I think we are heading for an increasingly bright future in the planetarium industry, provided that we never forget about the reasons why we are here.

What will the rest of this century hold for us? In terms of material for presentation in our domes, we can be fairly sure that we shall see humans on the moon again within the next two (perhaps three) decades, and hopefully this century will also see people walking on Mars for the first time. Undoubtedly, we shall also have many more spacecraft exploring the solar system, and there will be many discoveries made. I am personally very much looking forward to 2014, when the European Space Agency's Rosetta craft finally reaches comet Churyumov-Gerasimenko and the associated lander arrives on the comet's surface. Ground- and space-based astronomy, too, will undoubtedly produce some very exciting and perhaps unexpected results, together with increasingly spectacular images.

Projection planetariums have been around for over 80 years now and I think that they will continue to be with us for quite some time to come. I shall make the bold prediction that optomechanical projectors will still be used by a significant number of the world's planetariums at least well into the 2020s.

It was recognised, especially in the USA in the 1960s, that getting the message to the public about astronomy and space activities by using planetariums was very important in retaining support for what was being done; this, in my opinion, will not change. I envisage that the lion's share of astronomical and space-based research will continue for a long time to be done, or at least funded to a major extent, by government bodies and that public support will be vital.

Domes Will Always be Important

The fact that the night sky appears to us to be a sphere will never change, and so our domes will always be important. The night sky in the year 2108 will look much the same as it does right now in 2008, and a realistic simulation of it will still be important in order to explain its appearance and the motions, both real and apparent, of celestial objects.

Much of what I have said so far is based on educational topics, but there is another thing we do as planetarians: we bring enjoyment to people. In addition, we bring enjoyment to ourselves. As we all know, there is nothing better than to be told by members of an audience, after seeing a show, how much they liked it and how they are keen to look at the sky that night to find for themselves what we have pointed out in the live "current night sky" section of our shows (you do all do that, don't you?).

Part of the enjoyment we deliver is, in a way, sad, because it is important for an unfortunate reason. There are many people around the world who see some things only in the planetarium because light pollution in the big cities in which they live limits their view to third or even second magnitude objects, or worse. I even occasionally meet some planetarians who have seen the Milky Way only in the planetarium dome, although, of course, that is not their fault!

So in this, the last in my series of messages, I congratulate you all and urge you to keep up the good work. We planetarians make our mark on the world, and continue to improve the world in our own special, and highly skilled, way.

I also wish to convey a huge thank you to all IPS members around the world for having me as your president in 2005-2006 and for the two years before and after as president-elect and past president. Thank you, especially, to members of the IPS Council, committee chairs, and very importantly my fellow IPS officers, who work so tirelessly. I shall miss every aspect of working as an officer, and especially missed will be working so closely with Susan Button, Tom Mason, Shawn Laatsch and Lee Ann Hennig, and in previous years with Jon Elvert and Martin Ratcliffe.

I can assure you all that my support of the IPS will continue. I have very much enjoyed my role in international relations, which I shall be happy to continue with presidential approval, and look forward to contributing information on that topic to the International News Column. I also look forward to being involved with other IPS activities. You may even see me at Council meetings and, of course, I shall be there in Alexandria in 2010.

Finally, I wish you all the best for the New Year and for whatever celebrations are close to your heart. My thoughts will be with you all.
Relive the exciting early days of space exploration

Dawn of the Space Age

Distributed by: Sky-Skan, Zeiss, E&S, Mirage3D
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Digital Domes: From Frontier to Mainstream

Since the first Digistar projector was introduced into the planetarium market over 25 years ago, digital dome projection has been seen as the frontier—if not the fringe—of planetarium projection technologies. For 85 years the star projector reigned as the quintessential icon of the modern day planetarium, with all other projection devices—slide projectors, special effects, even video—taking a second seat to the dome-centric (and largely, geo-centric) astronomical simulator.

The past decade has seen the emergence, rapid growth and maturation of multi-projector edge-blended and fisheye dome displays. Digital planetariums have evolved into powerful immersive visualization environments that now reach every corner of the planetarium market, from the largest institutional domes to the smallest portable planetariums. The Planetarium is filled with articles, news and talk about the latest fulldome technologies and programming. Digital planetariums can now rightfully be considered mainstream—not frontier—planetarium technology.

With a sense of accomplishment, I am retiring the Digital Frontiers column after nearly four years of publication. It will be replaced by an IMERSA News column designed to keep planetarians up to date with the latest full-dome happenings largely outside of the mainstream planetarium market, including theme parks, art museums, visitor centers and special events. IMERSA (the association of Immersive Media Entertainment, Research, Science and Arts) is working cooperatively with IPS to guide, serve and grow the fulldome industry, both inside and outside of traditional planetarium markets.

In this final issue of Digital Frontiers, we take a look at where digital domes fit within the greater digital media landscape.

Digital Media Explosion

Media technologies have changed radically in the past decade thanks to the digital revolution. The number of television channels has more than doubled, the video game market has tripled, and the number of Internet users worldwide has increased by a factor of 60. People now shop, work, play, and meet one another online. The popular social networking site MySpace, founded in 2003, is now valued at nearly $20 billion (USD) by some industry analysts. The Second Life “metaverse”—an immersive virtual world where people create self-representational “avatars” that work and play—boasts 13.4 million members and $25 million USD in actual user-user transactions per month. The online world offers a plethora of choices, deep interactivity and instant gratification.

Today's new generation of online, interactive entertainment consumers—the “millenials”—will clearly demand more from their out-of-home leisure experiences as well. The transformation of out-of-home entertainment is not proceeding at quite the same pace as online media and networking, perhaps due to the more extensive physical infrastructure required, but the switch to digital technologies is clearly underway. There are now over 6300 digital cinema screens in the world, with nearly 5000 of these in the U.S. 1

The Stereo 3D digital cinema integrator, RealD, recently reported orders for over 5000 screens worldwide, 2 with a currently installed base of around 1300 screens in the U.S. A recent $1 billion USD deal between Hollywood studios and exhibitors reportedly will upgrade some 20,000 multiplex screens in North America to digital projection. 3

Modern motion picture films themselves have benefitted from the digital revolution with huge advances in digital animation and special effects. We can now simulate virtually anything that the mind can imagine. However, even with all of these advances, the movie theater experience is quintessentially a linear, non-interactive story, whether exhibited via film or digital projection. Video games have the distinction of delivering true interactive storytelling, and this market is expected to top $57 billion by 2009. However, the out-of-home segment of this market remains small by comparison, with the video game arcade market now less than a quarter of its original size when it peaked at $7.3 billion in 1983.

IMAX Goes Digital

The digital revolution also has hit closer to home with Imax Corporation's recent release of their new digital theater. The company has already sold 170 new digital screens, with about 50 of these expected to be installed by the end of 2008. Richard Gelfond, co-CEO of Imax Corp, told a meeting of IMAX theater operators and filmmakers at the recent Giant Screen Cinema Association (GSCA) conference that “we don’t think of [IMAX] as the giant screen.” Rather, he said, “it is the best immersive experience on the planet.” 4

Imax Corp.'s new digital theater, demonstrated to GSCA attendees at New York City's AMC Empire 25 multiplex, features two Christie CP2000XB projectors with custom lenses and a Doremi video server. The two projected images are overlaid with a 1/2-pixel offset—a technique often called “super-resolution”—which essentially spatially multiplexes a higher resolution image source to provide an effective resolution approaching 2800 x 1580 pixels (4.42 megapixels). A camera-based automatic alignment system maintains the precise overlap between the two images and also allows remote monitoring of image quality.

According to David Keighley of Imax subsidiary DKP/70MM Inc., the contrast ratio of the new digital system is 2,700:1 and the brightness is 21-22 foot-Lamberts on the relatively small 8.5 x 17.7 m (28 x 58 ft) screen. The high brightness and contrast adds to the “wow factor” and at least partially compensates for the lower resolution. Some attendees found the DLP “screen door” effect, caused by the dark space in between the pixels, objectionable when sitting in the front rows. Of particular interest is the near 2:1 screen aspect ratio, 6

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which is a radical departure from the 1.431 aspect ratio IMAX GT and SR theaters.

Many GSCA attendees enjoyed the overall experience, likening it to a premium multiplex theater. However, Imax Corp.’s marketing decision to not differentiate the new digital theater from their larger, more immersive and higher resolution film-based cousins caused a bit of an uproar. Independent filmmakers and institutions alike called for Imax Corp. to clearly designate these new theaters as digital so as not to dilute the giant screen IMAX brand that many of them spent years building.

None would deny that the future of large-format film is clearly digital. As large-format film theaters increasingly turn to digital projection, the possibility for convergence with fulldome theaters has obvious advantages for both camps. One advantage is access to a greater number of giant screen theaters for fulldome programmers, plus increased availability of large-format films in digital domes of all sizes. A second advantage is the possibility of digital large-format theaters incorporating alternative programming from digital domes, including real-time programming.

Digital Domes

So how are planetariums supposed to compete with this transforming media landscape? Make no mistake; many public institutions must compete directly with regional entertainment venues, including cinemas and IMAX theaters for customers.

Thanks to the growing number of vendors and institutions pioneering advanced digital domes and related programming, planetariums are actually faring quite well. Consider, for instance, that there are approximately 100,000 cinema screens in the world. With only 6300 digital screens, we see that less than 7% of all cinema screens worldwide have converted to digital thus far. In contrast, there are around 3,300 planetariums in the world, and some 483 of them are digital. That’s nearly 15% of the entire planetarium market.

Within the U.S., nearly 5000 of the 37,000 movie screens are digital—close to 14%. Amazingly, planetariums are keeping up with, if not leading, the digital revolution, with an international conversion rate that is double that of digital cinemas.

Beyond the fact that they are both digital, there are striking differences between digital cinema and digital dome capabilities. Many think that the “next big thing” in digital cinema is alternative programming, including live multicast concerts, operas, and sports events. While there have been early successes, it will be some time yet before the networks are in place for digital cinemas to fully exploit these capabilities.

In contrast, digital domes are already firmly established in alternative programming. In addition to live multicast events (such as the recent New York Metropolitan Opera screening at Paris’ La Géode) and over 100 pre-produced linear shows, most digital theaters can also provide live tours of extensive astrophysical datasets using advanced real-time graphics processing units. This is a key capability not found in digital cinemas or giant-screen film theaters. I would argue that the real-time interactive features of digital domes sets them firmly ahead of the curve, and positions them to make a giant leap in capability that will clearly differentiate them from competing out-of-home family-based experiences.

Imagine the future fulldome theater as a real-time group immersive portal, a giant web browser of sorts, allowing audiences to: be transported into remote worlds via immersive camera feeds; immersed in simulated environments; fly through scientifically accurate datasets of cosmic, microscopic or quantum proportions; participate in worldwide video game tournaments; watch live events and performances; participate in cultural fine art performances; and, yes, marvel at the beauty of the night sky. We have all seen how the internet has brought to our fingertips the accumulated knowledge of mankind. Networked digital domes will soon bring this capability to group audiences, delivered not from a desktop computer, but from the world’s most powerful media delivery systems. Digital cinemas cannot possibly compete with such a system.

Realizing the Dream

While the promise of fulldome theaters has been apparent for some time, realizing the dream is a process that will take years. The steps necessary to succeed are now clear.

(Please see Digital on page 68)
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Hmm. What shall I cook for tea tonight? I think I’ll do a shepherd’s pie, followed by rhubarb crumble for dessert. Great, that’s the gastronomy sorted, now for the astronomy.

You will note from my contact details above that I have branched out and now work for a company that sends me round to UK schools doing curriculum-based science presentations, many of which are space-related. The kids call me Solar Steve. I’m having way too much fun.

On to the topic for this issue. As you well know, the International Space Station (ISS) had a very rough gestation period from the early 1980s, up to the point when the first element, Zarya, was launched in November 1999.

The project has had more lives than a cat that had got Fate drunk one night and fooled it into signing a particularly whacky pact. The ISS was on the verge of cancellation in the early days after its mirror’s optical problem was discovered. “White elephant” is the term most often used to describe ISS among its detractors. Yet I feel that, while, yes, there are things about the ISS we can justifiably carp about, its true worth probably won’t be seen and acknowledged for a few more decades, when we’re at the point when people return to the moon and travel on to Mars.

We can only hope that it will have achieved perhaps a modest revered status by then. Bear in mind that attitudes change with each generation, so the way we perceive the ISS now won’t necessarily always be so.

The research onboard the station is a key precursor to NASA’s ambitious long-term goals. But to the general news media it’s boring, because each of the astronauts involved are only one of dozens who have ventured no further than Earth orbit, and the science experiments aren’t headline-grabbing. Where’s the excitement? Where’s the beef? It’s all too run of the mill for them.

Like the rest of you, sometimes I get frustrated by the apparent lack of anything of note happening onboard for long periods of time, but I think we have to trust that the movers and shakers in NASA knew what they were doing when they went ahead and commissioned the project. We educators know a fair bit more about space travel than your average person in the street, but those NASA folks know a whole lot more than we do, so let’s trust in their judgements, guys, at least for the time being. Take the long view.

ISS: Plenty of Education

So against that rather lengthy backdrop, I thought it would be instructive to devote this issue’s column to an overview of the educational opportunities that are linked, directly or indirectly, to the ISS. I believe we owe it to the public to show them another aspect of this project they probably wouldn’t otherwise see.

The station consumes more of NASA’s budget than any other project on its books except for the shuttle fleet, so I think we should bring it in from the fringes of our educational initiatives.

You could do worse than start by purchasing a decent scale model of ISS. There are a number of suppliers out there, but I’ve just picked one at random: Dynamic Modelling, 219 Roma Street, Redlands, California, 92373 USA (www.dynmodel.com/iss.html). A good, detailed model should be at the heart of your educational efforts for visitors. It will generate lots of interest and questions.

The full complement of ISS laboratories is now almost complete, and the mini science laboratories are operational, too. Earlier this year, the European Space Agency’s Columbus module and the Japan Aerospace Exploration Agency’s Kibo laboratory joined the U.S. Destiny lab in orbit.

More Assembly Missions

The few remaining research facilities will travel to the ISS on the handful of assembly missions left on the shuttle fleet launch schedule, available at www.nasa.gov/missions/highlights/schedule.html. You can catch up on the science results from these laboratories at www.nasa.gov/mission_pages/station/science/index.html.

Since 1983, dozens of astronauts on the ISS and a number of space shuttles have spoken from orbit to regular citizens all over the world using the ham radio network. Today it is officially referred to as Amateur Radio on the International Space Station, or ARISS. This initiative is sponsored by NASA, the American Radio Relay League and the Radio Amateur Satellite Corporation.

As one of the organisers put it, “To see the look on the faces of those young students as the astronaut’s voice first comes out is truly overwhelming.” ARISS has facilitated conversations between station astronauts and people in Russia, Japan, Canada, Europe and the USA. Find out more at www.rac.ca/aris.

The general public can also make contact with Station astronauts in email form by posting questions on a dedicated web site at www.nasa.gov/mission_pages/station/main/qa.html. This page also allows you to view questions already asked, along with the answers.

There’s a pretty decent array of ISS multimedia options at www.nasa.gov/mission_
Watch the ISS Fly Over
To show your visitors how easy it is to spot the Station flying over your part of the world with the unaided eye, go to: www.jsc.nasa.gov/sightings. Seeing it for themselves from their garden, perhaps, will make the station seem less remote and unattached to their lives.

On the web page spaceflight.nasa.gov/gallery/images/station/assembly/indexpage1.html you’ll find dozens of photos taken from orbit that show what the station looked like after each module was added since 1999. Stringing these together would make for a good PowerPoint presentation in your exhibition area.

The station, of course, an international mission, and so if you go to www.esa.int/esaHS/education.html you’ll find out what educational initiatives the ESA is deriving from its participation. For starters, they have set up the ISS Education Fund and donated one million Euros to it. The initiatives that this money funds can be used by educators in all European community member countries.

An outgrowth of this is ESA’s ISS Education Kit, which is aimed at students ages 12 to 15. More information is available at www.esa.int/esaHS/ESAYIF8057D_education_0.html. The development of the Education Kit goes back to 2001, when ESA organised a conference for European teachers, TEACH SPACE 2001, which was designed to assess what could be done to support European educators. The conclusion was that teachers need simple, practical, and modular material that is based on European curricula.

And so, in cooperation with a group of 20 educators, ESA commissioned a pilot print version of the ISS Education Kit for European secondary schools. In 2002 this was sent to educators throughout Europe for testing and evaluation.

Based on feedback received, the kit was improved and translated into all the languages of ESA’s member countries. In December 2006 NASA published the National Laboratory Education Concept Development Report (www.nasa.gov/audience/foreducators/topnav/materials/listbytype/ISS_Education_Plan.html), which explored the potential of the station to engage, inspire and educate students and teachers in the areas of science, technology, engineering and mathematics. The report concludes that there is huge interest from a diverse list of government departments unrelated to NASA.

The report also references another NASA publication, Inspiring the Next Generation: Student Experiments and Educational Activities on the International Space Station, 2000–2006, which is a project that NASA estimates involved over 31 million U.S. and international students from kindergarten to college age.

“Educators have found that students are really motivated when they can compare their experiments in the classroom with similar investigations on the space station,” said Julie Robinson, ISS program scientist at the Johnson Space Center in Houston.

There is a particularly popular project currently operating on the station, the Commercial Generic Bioprocessing Apparatus Science Insert, which uses small growth chambers in an incubator to help students investigate the effects of living in space on small plants and animals.

“These experiments are providing an extraordinary educational experience to thousands of elementary, middle and high school students who otherwise would not have access to science conducted on board the station,” said Stefanie Countryman, Education Program co-ordinator at the University of Colorado.

Take a Look at EarthKam
By accessing the EarthKam web page (earthkam.ucsd.edu), U.S. and international students can manoeuvre a special digital camera mounted in a station window. This allows them to photograph a wide range of features on the Earth and later study the photos to learn more about physical features such as volcanoes, mountain ranges, river deltas and so on.

“We are giving students the opportunity to not only operate something in space, but also learn about geography in an exciting way,” said former astronaut Sally Ride and EarthKAM’s principal investigator. “It’s amazing to see how many schools are benefiting from this experiment and gaining a new understanding of the world we live in.” More than 82,000 students in 1,260 middle schools in the U.S. and 15 other countries have participated in the EarthKAM project.

So, the conclusion from my potted and far from complete efforts, given the limited space here, is that there are a multitude of opportunities out there to build up a significant and rewarding ISS education programme for your visitors. If you put in the effort, there’s plenty of stuff there to reward you. You will be giving your visitors a much greater insight into how the large amount of money assigned to the ISS project is spent.

People will also see the station’s ongoing ability to be a guiding star, as it were, for the ambitions of up and coming scientists of the future, not only in the U.S. but across the world.

Well, it’s happened again. The Fred Hoyle of Time has just tweaked the nose of Fate (stand by for the fist fight), which means I’m out of space.

(Digital, continued from page 65)

**DomeGrid**. High-performance photonic network interconnectivity is vital to this path. Institutions interested in exploring the creation and use of a high speed photonic DomeGrid should attend the upcoming CineGrid Workshop this December 7-10 at Calit2 in San Diego (www.cinegrid.org). In addition to learning how your facility can access high-performance photonic networks, you will be treated to test reels from the world’s highest resolution digital video cameras and talks on production workflows for 4k digital cinema and beyond.

**Model of the Known Universe**. Another important step is the curation of fulldome 3D datasets, models, simulations and clips. The American Museum of Natural History’s Digital Universe Atlas, now used by several of the leading fulldome vendors, is a template for this curation process as it applies to astronomy and astrophysics. I have been promoting a multi-agency, multi-institution, multi-national Model of the Known Universe Project that would fund and coordinate individual curators of scientific, cultural, historic and artistic data for immersive projection. Assets would be stored on server farms on major DomeGrid nodes and made available to photonic nodes as real-time streaming video and audio, or to internet subscribers via download.

In addition to immersive theaters, these datasets—representing the accumulated heritage of mankind’s knowledge of the universe—would be accessible via the web and made available to filmmakers, artists and the general public through a pre-negotiated licensing template.

**Cognitive and Educational Research**. Correct application of group immersive visualization will require research into what is unique about the medium and effective ways to use it. We are already seeing some early studies at the Universe of Plymouth and elsewhere.

**Industry Standards, Guidelines and Specifications**. The fulldome industry is ready to move forward with defining content exchange specifications, standard terminology, technical specifications and more. Fulldome specifications can be harmonized with large-format digital cinema specifications through both GSCA and White Oak Institute’s DISCUSS (Digital Immersive Screen Colloquium for Unified Standards and Specifications) project, allowing network compatibility with the coming wave of giant screen digital cinema systems.

**IMERSA**. The association of Immersive Media Entertainment, Research, Science and Arts was founded to serve and facilitate the growth of the fulldome medium. IMERSA needs your support as a sponsor or member. To join, go to www.imersa.org.
Now with **lessons** designed for the dome

As planetarium educators, you need fulldome capability you can really use. That’s why we created the **SciDome Fulldome Curriculum** - lessons made specifically for dome education. Created by Dr. David H. Bradstreet of Eastern University, the curriculum focuses on the units you teach most: Moon Phases, Seasons, Planetary Motions and Coordinates - plus mini lessons on a variety of topics like the speed of light, ancient observations, precession, and others. The Fulldome Curriculum uses the dome to visualize space science in a unique, three dimensional way. Lessons include interesting “What If?” simulations, where we change the behavior of planets, moons and space itself to help students understand astronomy. The curriculum includes Starry Night simulations, ATM-4 control scripts, digital slide graphics, and presentation notes. Available exclusively for the SciDome and SciDome HD systems.
In the September 2008 issue I discussed the distinction between copyright protection and copyright registration, and the benefits of properly and timely registering your copyrighted works. To recap in brief, registration is a prerequisite to filing suit for infringement, and timely registration entitles a copyright owner to enhanced damages and attorney’s fees in the event of successful infringement litigation. Copyright registration also provides public notice of a copyright owner’s claim, and the registration certificate serves as evidence that the copyrighted work listed on the certificate is validly copyrightable, eliminating the need to prove that point at an infringement trial.

In this installment I address the mechanics of copyright registration and offer a brief primer on how to use the U.S. Copyright Office’s new online registration system, dubbed “eCO” for “electronic Copyright Office,” which launched in July.

Online or On Paper

Before eCO was launched, the only way to register a copyright was to complete one of several registration forms and mail it to the Office, along with the appropriate payment and a copy of the work for which copyright registration was sought. The whole process took ages, and while registration was effective on the date the registration materials were received by the Office, it was nearly impossible to determine the status of a particular application until a certificate, or a letter requesting additional information, arrived months later.

eCO, while still not a model of speed and efficiency, has improved the process dramatically. Now registrants can track the status of their claims online, upload deposit material electronically (the deposit requirement is discussed below), and pay by credit card or electronic check. And the registration fee is lower; it’s now $35 per registration, versus $45 to file on paper.

For those who still want to file on paper, the Office recently released a new single registration form – Form CO – that replaces the battery of forms from which registrants previously had to select. The form is available online at www.copyright.gov/forms. The fee remains $45 for paper applications. Although the Office has made its forms available online and electronically “fillable” for some time, Form CO is new in that it converts the text to a single barcode that the Office scans when it processes your application.

A word of caution: mail to the Office can take weeks to be properly delivered because of the security procedures for mail to government offices. Thus, deliveries by courier, like FedEx and UPS, are the best way to send materials to the Office. Regardless of which method you select, always use a traceable service, so that you have evidence of the date on which the Office received your application.

Registering via eCO

The Copyright Office’s online registration portal is located at www.copyright.gov/register. After you create an account and log into the system, you will reach the eCO’s home page, from which you may check the status of existing registration claims, or start a new one.

The registration process can be divided into three basic steps: the application, payment, and uploading the deposit material.

The first step is to determine which type of work you seek to register. For planetarians, the most commonly used classifications include literary works (books, curriculum materials, exhibition text), works of performing arts (show scripts), visual arts (images, illustrations, photographs), sound recordings (soundtracks), and motion picture and audiovisual works (full shows). There are some technical peculiarities with the Office’s definitions of each type of work, so be sure to read explana-
tions provided on the Types of Work selection page by clicking on each category.

The eCO system will guide you through each question on the application. In the event that you are missing relevant information, you can simply click “save for later” and come back.

Although most of the questions are fairly straightforward, there are a couple areas on the application that are worthy of note. In the “authors” section, you should take care to ensure that each author’s contribution is properly designated as an individual contribution or a work-for-hire contribution, and in the “claimants” section, make sure that the owner of the copyright claim is properly listed. In many cases, the authors may not be the claimants because the authors’ contributions were made within the scope of an employment relationship; the copyright claimant would, thus, be the employer.

The other section of note is the “limitation of claim” section, which requires you to describe what, if any, material is not part of the copyright claim. This may be relevant if you intend to register works that are comprised of components prepared by third parties, or materials in the public domain. For example, if you were registering the copyright in a planetarium show, you might need to exclude from your copyright claim any images prepared by NASA.

After you have completed the substantive portions of the application, eCO will ask you to review a summarized version of the application. After ensuring that everything is correct, click the “add to cart” button to begin the payment process. The Copyright Office uses pay.gov, a payment portal site used by numerous government agencies, to facilitate payment of the registration fee. After working through the prompts there and submitting payment, click the “submit payment” button to return to eCO, where you will begin uploading your deposit material.

**Deposit Requirements**

U.S. law requires that all applicants submit at least one copy of the work for which registration is sought. In cases where the work has been published, the applicant generally must submit two copies of the “best edition.” The definition of “best edition,” although not particularly complicated, is lengthy. Copyright Office Circular 7B is instructive, and can be found at www.copyright.gov/circs/circ07b.pdf.

Generally, in the case of electronic registration, the deposit requirement can be satisfied by submitting an electronic copy of the copyrighted work. In some cases, though, you may still be required to submit a hardcopy, and you always have the ability to submit a hardcopy if you simply don’t want to upload an electronic version.

If you mail your deposit, eCO will provide you with a bar-coded shipping slip to include with your deposit materials. If you submit electronically, you will be guided through the upload process, which requires you to select the relevant file or files from your hard drive. eCO accepts most major industry-standard file formats for data, images, audio, and text. The complete list is available at www.copyright.gov/eco/help-file-types.html.

**What Happens Next**

You wait. Although processing times for eCO applications are significantly faster than paper-based applications, it still takes several months for the Office to issue a registration certificate. As with paper-based applications, the registration is effective as of the date the copyright office receives the application, but unlike paper-based applications, you can check the status of your application at any time by simply logging on to eCO.

**Finding More Information**

This column provides basic background on the eCO system and the copyright registration in general. For a more in-depth discussion of the eCO registration process, and to see more examples and screen shots, take a look at the Copyright Office tutorial, available at www.copyright.gov/eco/eco-tutorial.pdf.

Although the copyright registration process is relatively straightforward, like everything law-related, your circumstances may give rise to unique issues, and mistakes in a copyright registration can adversely affect your rights should you need to bring an infringement claim down the road. As usual, it’s always advisable to talk to qualified, competent counsel before filing applications for copyright registration.
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As I write this in mid-October, it is fall in Sweden. There is not yet any snow where I live, but it has already fallen in northern Sweden, in Lapland. At my latitude there are rather dramatic changes at this time of the year. Every week, the days get about 1/2 hour shorter and the nights 1/2 hour longer. When the sky is clear, the fall sky is beautiful! Interestingly, if you keep watching the sky an hour after sunset, it will remain more or less unchanged for several months in the fall.

The International News column is dependent on contributions from IPS AffiliateAssociations all over the world. Many thanks this time to Agnès Acker, Bart Benjamin, Ignacio Castro, Gail Chaid, Kevin Conod, Alex De livorias, Alan Dyer, John Hare, Nataliya Kovalenko, Shaaron Leverment, André Milis, Dan Neafus, and Loris Ramponi for your contributions. Upcoming deadlines are 1 January for the Planetarian of March 2009 and 1 April for June 2009.

Aspciation of French-Speaking Planetariums

Nelly Dumas invites planetarians to the 25th APLF conference in La Cité des Sciences et de l’Industrie, Paris-La Villette. The conference is planned for 21-24 May, 2009, and will present in particular fulldome video productions, including short (10-minute) sequences. For more information, contact aplf@astro.u-strasbg.fr.

The International Year of Astronomy is being actively prepared by the French Planetariums.

The APLF/ESO IYA09 show The Quest of Our Cosmic Origins is now available in 6 languages for all types of planetariums; contact aplf@astro.u-strasbg.fr. The show costs 40 €/seat for fulldome theaters and half that price for classical planetariums. Many French planetariums are presenting exhibitions on the invisible light to inform the public about spectroscopy and IR and radio observations in conjunction with the program.

A portable device, COSMODYSSEE IV (projector and dome), will be given by RSA Cosmos to the best 2009 project of implementing a planetarium in France and maintain it for three years.

New planetariums built in and being planned for 2008-2009 are Cosmodyssée in Rennes (La Couyère, portable, 30 seats); Buthiers (near Fontainebleau, 35 seats); Aspres sur Buech (portable 5 m, and installation of a planetarium planned in Savines-le-Lac); and St-Michel-l’Observatoire (10 m, to be built in 2009, information at www.cg04.fr).

Association of Italian Planetaria

In Catania, meetings began in November for schools and individuals interested in cosmology and astronomy, including some supported with lessons at the Astronomic Observatory in Catania, Etna. More information is available from email ds@politecnicodelmare.it and politecnicodelmare@postecert.it.

Lara Albanese reports that for some years now the Arcetri Observatory in Florence has been organizing a program for children about discovering the myths and legends of the sky originating from different parts of the world. The starry sky, in fact, unites children of the
whole Earth because every night the stars twinkle on the heads of each one, rich or poor, city dweller or country dweller, big or small alike.

With the conviction that every child has a favorite language with which to communicate and that the multiplicity of languages helps comprehension all over the globe, Arcetri Observatory staff has decided to split the program into three stages: the first dedicated to the observatory’s itinerant planetarium, the second to a meeting with an astronomer from a distant country, and the third dedicated to an interactive workshop.

For the 2008 edition of the Science Festival in Genoa, held 23 October-4 November, invited speakers were the Indian astronomer Arvind Paranjpye and the South African astronomer Thebe Medupe, who offered observations of African skies in the Starlab planetarium. Also offered was a workshop where students were able to construct a telescope. For information, visit www.festivalscienza.it/en/programma/diversita.php?area_tematica=2.

A new planetarium opened at the end of August in Nus, a small town located in the Alps Mountains. It has a 10-m dome, 65 seats, and is equipped with a ISS RSA Cosmos 6 channel system. To be precise, the planetarium is located in the small hamlet of Lignan, 1633 meters above sea level. Only a few dozen people live here, but the hamlet is very focused on astronomy due to the presence of one of the biggest non-professional astronomical observatories in Italy. In this observatory, research and popularization of science are carried on throughout the year, and once per year the popular Italian Star Party is hosted. The planetarium will be open to school pupils and the general public at the beginning of 2009.

In December 2007 the Ignazio Danti Planetarium in Perugia, annexed to the A.Volta LT1, organized the event The traces of Ignazio Danti in sixteenth century Perugia in collaboration with the provincial administration, to bring to attention this important cosmographer. The following trail has been drawn from that experience:

- a trek through sixteenth century Perugia from the centre to Piscille, where the Institute is located,
- a visit to the permanent exhibition on Ignazio Danti at the school, and
- a program in the planetarium.

This trail is open permanently to all schools and the public. For more information visit www.planetariodanti.pg.it/starlab/index.html or www.naturaventura.it/Documenti/Ignazio%20Danti.pdf.

For the third year in a row, in 2008 the Planetarium of Rome ranked among the 10 most visited science museums in Italy, with a total of about 100,000 visitors per year. The intense educational activity for schools (ages range from 3 to 20 years old) increased with the introduction of three new show times in the afternoon, due to the extremely high demand by teachers from the schools of Rome and central Italy.

Their main effort towards the general public was Astrosummer ‘08, a two-month long series of night shows during July and August, when special programs for adults, kids and foreign visitors were presented every night (including two new shows for children and one in English). Astrosummer ‘08 was attended by a total of more than 9000 visitors throughout the season, a record attendance compared with the previous years, when the opening times were mostly diurnal.

The planetarium used the opportunity given by Astrosummer ‘08 to start an extensive evaluation study of the public, the results of which will be available in the coming weeks.

Continuing the tradition opened by the Cartellone 2007, the planetarium offered again several successful formats like the Full Moon Gatherings and Astronomers for a Night; they also began experimenting with the exportation of their formats and languages to other non-planetarium locations, like the gardens of Villa Torlonia-Technotown, for a Short Course for Wannabe Astronomers. However, the main effort during 2008 for the Planetarium of Rome has been planning activities for the International Year of Astronomy 2009. They gathered the main astronomical institutions of the city in a working group and produced a project, called Rome, an Astronomical City, which is currently under evaluation by the City Council.

In parallel with these innovations, the cultural activity of the Planetarium continued in 2008 with participation in special events such as Rome’s Darwin Day, Easter at the Museum, and the European Researchers’ Night 2008, organized in collaboration with the National Research Council, which drew an audience of about 5000 people on the night of 26 September. The scientific outreach of the planetarium is ensured by the presentation of talks at the Annual Meeting on the Communication of Science in Forlì and Bergamo. Finally, the Planetarium of Rome has been very active on the national scene, pushing for the birth of the professional Association of Italian Planetaria, now named Planit.

Association of Mexican Planetariums

AMPAC member planetariums, educational institutions, amateur astronomical associations and many other cultural organizations throughout Mexico have been invited to participate on January 31, 2009 in an event denominat ed “Nuit des Etoiles” or Stars Night, organized by the cultural affairs department of the French Embassy in Mexico. The event will be simultaneously celebrated in all planetariums in France as well. The common theme will be “Our Ancestors’ Heavens.” The main objectives of the event are:

- transmit to the public the joy of studying the night sky,
- show that science is universal and international,
- popularize science, so the public may feel that knowledge belongs to them, and
- awaken scientific vocations.

Two new Evans & Sutherland digital projection systems have been installed in Mexico. The first one is a Digistar 3SP2HD, installed at the Museo Tecnologico de C.F.E. Planetari-
The planetarium is being refurbished and modernized at long last, increasing its projection dome to 12 meters in diameter, installing 84 unidirectional seats, adding E&S 5.5 sound, and changing to all-LED illumination. The updated facility is to be inaugurated by the end of 2008.

The second one has been installed in Southern Mexico, in Tapachula, Chiapas at the Colégio de Bachilleres Planetarium. It is a a Digistar 3 SP2, under a 10-m unidirectional dome with a seating capacity of 60. It, too, will have E&S 5.1 sound and all-LED illumination. The inauguration date had not been set.

These two new digital E&S projectors now make a total of 6 Digistar projectors being used in Mexico, including two in mobile planetariums.

AMPAC’s annual meeting was held 19-21 November at the Technology Museum & Planetarium of Xalapa, Veracruz. More details of this meeting will be given in next issue of the Planetarian.

British Associations of Planetariums

From the Scottish Highlands to the Sussex Downs, planetarium domes across the UK are preparing for their centre-stage role to get the message of the International Year of Astronomy out to the UK public in 2009. Drawing public attention to the UK contribution to astronomy is the Telescope400 project (telescope400.org.uk). Together with the celebration of the 400th anniversary of Galileo’s use of a telescope to study the night sky, here in the UK we also have Galileo Live! Thomas Harriot made his own observations of the moon from Middlesex in 1609. He independently discovered spots on the sun, drew the first plausibly accurate map of the lunar surface, viewed the Pleiades, and also monitored the motions of Jupiter’s moons (after Galileo’s announcement of their discovery). So the UK has something extra to be proud of this coming year!

Of course, the moon is playing a major role in observing events and planetarium shows. Everyone remembers the first view of the moon through a telescope as it opens itself up as a whole new world of craters and ancient lava seas. The moon is an easy and accessible target for all ages and a great first inspiration to look further into the worlds that glitter our night’s sky.

Riding on the importance of the telescope in astronomy today and in the past, and in anticipation of the coming year, INTECH planetarium in Winchester was running a free advice event in October to help everyone get the best from any binoculars and telescopes they may have gathering dust at home. A chance to ask an expert and gain skills and advice for one’s own personal explorations that can then last a lifetime.

Familiarizing the night sky with local cultural and community relevance is also the key for a wonderful project in Scotland. Primary schools from all over Scotland are being invited to create a new constellation for IYA 2009, with each school choosing a star and connecting with the other participating schools across the country, led on their journey by a truly magical combination of art and science. If you’re interested to find out, visit www.cosmicsky.co.uk/pconstellation.htm.

From the local to the international—IYA is also about binding countries around the world under one sky. Various projects across the UK are using this as an opportunity to explore far off lands, educating and inspiring visitors with the myths and legends from different cultures across the globe.

Thinktank’s Planetarium in Birmingham is developing a presenter-led show about Chinese constellations, consulting with both Macao and Hong Kong planetariums to create an accurate and complete set of Chinese constellation drawings with 283 constellations in all!

As we stand at the brink of 2009, one of the greatest opportunities to get astronomy education firmly into the public eye, many domes such as Science Dome in Bournemouth are upgrading equipment and writing captivating new shows to take the word of astronomy out to the public. Many large permanent and mobile planetariums, usually filled to bursting with schools groups, are making major concerted efforts across the country to inspire adults and get families to learn together.

IYA gives everybody a focus and an opportunity to push for excellence and innovation. It is providing ways to create new community links both nationally and internationally and with the continued sharing of stories, successes and mistakes and more communication within our community.

Canadian Association of Science Centres

For IYA09, the Consortium of Canadian Planetariums (Montréal, Winnipeg, Calgary and Vancouver) is producing a nationally-funded planetarium show, Galileo Live!, with the Telus World of Science Calgary serving as lead facility. An initial two-day script workshop was held in Winnipeg at the end of July, with representatives from all four participating planetariums in attendance, to finalize the script concept and outline for this live-actor show. Based on the workshop’s conclusions, a draft script was prepared by early September for a show that opens in March 2009. Contact: Alan Dyer, alan.dyer@calgary-science.ca.

The Montreal Planetarium hosted the first meeting of the Advisory Board that was set up to reflect and give advice to the Direction Committee that oversees the relocation of the new Montreal Planetarium near the Biodôme and Olympic stadium.

The board made several useful remarks about the project as it was presented by Director Pierre Lacombe and Scientific Advisor Pierre Chastenay. Members of the Advisory Board come from a wide range of professions and backgrounds: science research, academia, science popularization, multimedia production, multimedia arts, and education.

IPS member Marc Moutin, from Toulouse, France, was present; Ryan Wyatt, director of the Morrison Planetarium in California, accepted to be part of the Advisory Board, but could not be present at the meeting. An architecture contest for the new planetarium should be launched later this fall.

In other news, a new Christmas show titled

With the launch of the International Year of Astronomy early in 2009, Telus World of Science is anticipating running the full-dome production of *Two Small Pieces of Glass* under development at the time of this writing. They are also planning a variety of other IYA activities for 2009 through partnerships with the Royal Astronomical Society of Canada and the local university and colleges. Contact: Frank Florian, fflorian@telusworldofscienceedmonton.com.

**European/Mediterranean Planetarium Association**

The Planetarium of the Thessaloniki Science Center and Technology Museum (TMTH) in northern Greece has just completed an important upgrade of its audiovisual equipment that will certainly prove invaluable in improving the immersive experience of its visitors. A brand new projection system using Barco Sim-SR DLP projectors has been installed and the viewing experience has been further enhanced by using Astro-Tec’s expertise in extending the spherical dome to 180°. Finally, thanks to a new translation/second language system and the use of wireless headphones, foreign visitors will now be able to enjoy all TMTH’s planetarium shows as well.

With the end of the summer holidays the Eugenides Planetarium staff in Athens, having recharged their batteries for the busy year ahead, once again welcomed the Hellenic public with a brand new planetarium production that premiered on Monday 6 October. *The 7 Wonders of the World* is a fascinating 40-minute journey to the furthest reaches of space and time, from stunning visual reconstructions of the fabled 7 wonders of antiquity to the 7 wonders of our solar system and beyond, to the 7 deep sky wonders of the universe.

Tuesday 18 November was a special day for the Eugenides Planetarium as it hosted a two-part presentation featuring traditional Hawaiian sky knowledge and the astronomical exploration of the largest observatories in the world located on Mauna Kea in Hawaii. In the first part, Master Navigator Kalepa Baybayan explained how the Hawaiian people used star lines to navigate the Pacific Ocean in voyaging canoes, while in part two, Shawn Laatsch, director of the Imiloa Planetarium of Hawaii and IFS Treasurer, presented the first *Update from Maunakea* planetarium show highlighting the Canada-France-Hawaii Telescope, Gemini Observatory, and Subaru Observatory. On the same day, Imiloa’s signature show *Maunakea: Between Earth and Sky* was shown to invited guests.

For its special Christmas show, the Eugenides Planetarium selected to screen *The Celestial Railroad* created and directed by the Japanese artist Kagaya. The 38-minute show is based on a story written in the early 20th century by Japanese writer and poet Kenji Miyazawa.

**Great Lakes Planetarium Association**

**Illinois.** The William M. Staerkel Planetarium at Parkland College in Champaign will present their live *Fall Prairie Skies* program, in addition to three returning favorites. They also began their *World of Science* lecture series with talks on stem cells, wind energy, and the Milky Way, the latter given by GLPA’s own Jim Kaler. The planetarium offered their five-week *Backyard Astronomy* public workshop in late September. To assist with their fundraising efforts for a full-dome system, the Parkland Foundation acquired sponsors to buy a Saturn Sky two-door convertible that was raffled off in late-October.

This September, the Lakeview Museum Planetarium recently added a show based entirely on their Uniview software. In November, laser light shows from AVI returned, and their Saturday morning *Basic Astronomy Series* included all new presentations using their Uniview software and the Sony Xbox game controller, allowing selected audience members to “fly” the planetarium to operator-selected destinations.

The Cernan Earth and Space Center of Triton College in River Grove welcomed back former astronaut Story Musgrave as its Big Event speaker in late-August. Story’s presentation, titled *EarthLight: the Beauty of our World Seen From Space*, combined stunning orbital photographs with music and commentary from this veteran astronaut of six space shuttle missions.

**Indiana.** Established in 1952, the Koch Planetarium at the Evansville Museum is Indiana’s oldest star theater. Plans for a new immersive theater at the Evansville Museum were unveiled in May. The medium-sized, full-dome video theater with a mechanical-optical star projector has a scheduled opening in 2011. The planetarium traveled its NSF-funded *Outreach to Space* exhibit to fairs and festivals this summer. During year two of this three-year astronomy project, over 10,000 people at rural venues in Indiana saw the exhibit.

The SpaceQuest Planetarium in Indianapolis experienced one of the heaviest summer attendance totals in years. It was thought that having *Far, Far Away: the Worlds of Star Wars* was a large part of that phenomenon. In the month of July, the show by itself brought in 14,000 visitors!

**Michigan.** Fall offerings at the Kalamazoo Valley Museum Planetarium were *Sky Legends*
of the Three Fires, which featured three Native American stories about the night sky, the live Constellations Tonight show, and Galaxies from Hansen Planetarium. Kalamazoo’s planetarium will celebrate its 50th anniversary at the end of May 2009.

The Roger B. Chaffee Planetarium in Grand Rapids, Michigan kept busy this summer with an assortment of astronomy-themed summer camps. They also premiered A Night in the Woods, a cross-curricular astronomy/ ecology themed show aimed at early elementary students. The exhibit staff of its parent institution, the Public Museum of Grand Rapids, has also been busy improving the planetarium’s lobby displays, including a localized, up-to-date Powers of Ten display on the scale of the universe, and a tributary exhibit to Apollo 1 astronaut Roger Chaffee.

The staff of the Dassault Systèmes Planetarium in Detroit has had a busy summer, with lots of summer campers receiving guided tours of the Digistar II night sky or learning how to think critically in their Bad Astronomy show. A new Sky-Skan PowerPoint Presenter system was recently installed, which permits the use of high definition video through their Barco 909 video projector.

The Cranbrook Institute of Science Planetarium in Bloomfield Hills debuted Invaders of Mars! by Evans & Sutherland shortly after Phoenix made its successful landing on Mars. Cranbrook astronomers have also been busy with astronomy summer camps, weekly observing sessions in their soon-to-be-renovated observatory, and plan to install a new teaching device co-designed by Head of Astronomy Michael Narlock and a team of engineers at General Dynamics.

Finishing off the summer was the 12th Astronomy at the Beach at Kensington Metropark, an annual astronomy event for the public sponsored by the Detroit Science Center’s Dassault Systèmes Planetarium and the Cranbrook Institute of Science’s Planetarium. Over 5,000 people annually enjoy views through dozens of telescopes, hands-on activities, night sky shows in the DSC’s Starlab, live tours of the evening sky, and presentations by local amateur astronomers, concluding in the keynote talk on radio astronomy by Dr. Mary Putman of the University of Michigan.

Ohio: Roy Kaelin reports that recent sky shows at the Shafran Planetarium at the Cleveland Museum of Natural History—Our Solar System: Beyond Belief and the children’s show Earth and Worlds Beyond—are tied in content to the debut of the upcoming traveling exhibition Beyond: Visions of Planetary Landscapes from the Smithsonian Institution. The exhibition features 35 large-scale prints that have been digitally processed by artist Michael Benson to create seamless photographs depicting the natural beauty and reality of space as seen by 40 years of space missions. The planetarium also offered a summer class on amateur telescope-making.

Dr. Ann Bragg has moved from Bowling Green State University to Marietta College, where she now directs the new Anderson-Hancock Planetarium, which is due to open later this year. BGSU Planetarium director Dale Smith enjoyed seeing the Perseid meteor shower under the clear dark skies of East Africa while on safari in Tanzania in early August.

Wisconsin/Minnesota: The University of Wisconsin-Stevens Point’s Allen F. Blocher Planetarium is showing their local production Gods of the Solar System along with shows from Loch Ness Productions and the Minneapolis Planetarium.

The Manfred Olson Planetarium at the University of Wisconsin-Milwaukee, in concert with their theater department, is designing a storytelling course which will emphasize astronomy myths as well as narratives about how we explore the cosmos.

The Titanic is docking in Milwaukee’s Daniel M. Soref Planetarium where the Houston’s Burke Baker Planetarium production Night of the Titanic will fill the planetarium sky. In October, Spooky Skies will return once again with new art and animations.

Moving on to the North Star State of Minnesota, Dave Williams and his staff at St. Cloud State University hosted a well attended 2008 WIMPS meeting. St. Cloud State is preparing two new shows for the coming year, The Life of a Star and The Milky Way.

At Mayo High School in Rochester, a public open house showcasing the recent renovation revolution was held in September. This year’s third grade students will be involved in a 2 1/2 hour study of the moon, Earth, and Mars using the planetarium, the new Magic Planet digital video globe, and a student "clicker" response system.

As the summer renovations at the Minnesota State University Moorhead Planetarium drew to a close, Dave Weinrich returned from Africa and the successful installation of a Medialogue star projector in Ghana’s first public planetarium.

Middle Atlantic Planetarium Society

Board members were recently elected by the Middle Atlantic Planetarium Society. They are: Lee Ann Hennig, Thomas Jefferson High School, Alexandria, Virginia; Steve Russo, Suits-Bueche Planetarium, Schenectady, New York; and Ted Williams, Mallon Planetarium, Norristown, Pennsylvania.

MAPS has also appointed a new chair for the Education Committee, John Scala of the Lenape Valley High School Planetarium in Stanhope, New Jersey (jscala@lvhs.org).

The Howard B. Owens Science Center in Lanham-Seabrook, Maryland will be the host site for the 2009 Middle Atlantic Planetarium Society Conference 13-16 May. Since the Owens Science Center last hosted the conference in 2003, they have developed and extended their partnerships with nearby organizations of interest, such as NASA-Goddard and the Johns Hopkins University Applied Physics Lab (JHUAPL). All planetarium enthusiasts are invited to gather to share educational activities and technology in order to help us all maximize the use of our unique learning environment.

The conference will include opportunities for members to participate in demos at the Visitor Center at nearby NASA-Goddard, including their Science-on-a-Sphere exhibit. A wide variety of speakers from both NASA-Goddard and JHUAPL will be available. The conference hotel will be the Comfort Inn & Conference Center in nearby Bowie, Maryland.

More information on the conference is forthcoming. See the MAPS website for the latest information: www.maps-planetarium.org. Conference host is Patty Seaton, H. B. Owens Science Center, Prince George’s County, Maryland, pxts13@yahoo.com, phone +1 301-918-8750.

Nordic Planetarium Association

Recently a new planetarium has opened in Nyrölä, some 20 km from the Finnish city Jyväskylä. It is called Kallio-Planetariaario, the Bedrock Planetarium. The core of the planetarium experience consists of a beautiful audi-
torium, which is surrounded by a large planetarium dome. The planetarium's advanced video projection technology makes it possible to create an awe-inspiring, three-dimensional picture, that encloses the viewer within. This experience is complemented by a massive sound environment. In addition to showing different star-shows in the planetarium, they, as first in Finland, are also able to show real-time telescope footage of the sky. The projector can also be used for viewing other movie, video, and computer material. For more information, visit www.kalliopiplanettaario.fi/en/services.

In the Planetarian of 3/2008 (September), some information was given on another Finnish planetarium, Tuorla Planetarium, which is part of Turku University, and is equipped with a Digistar-3 projector under a 7.5-m Eurodome. In September, Lars and Per Broman visited the planetarium and were treated with a pre-premiere presentation of The 7 Wonders of the World.

The planetarium staff consists of Aimo Silvanpää, mainly administration; Kari Nilsen, programming and administration; Pertu Keinänen, technical maintenance; Hannu Karttunen, program production; and Rami Rekola, web pages. Mail addresses are of the form firstname.lastname@utu.fi. For more information on Tuorla Planetarium, visit www.astro.utu.fi/planetarium.

Backyard Cosmos is the name of a small science center that has come closer to reality. Broman Planetarium has recently purchased a small farm in the north of Swedish region Dalarna. A planetarium equipped with a Digital Starlab projector under a 2.5-m Eurodome plus quite a few hands-on experiments have been setup in one of the buildings. A web page is under construction, www.bakgard.se.

Two planetarians who are well-known to Planetarian readers, Aadu Ott and Lars Broman, both became emeriti professors last year. Now they have initiated a new Swedish academy, Strömstad Academy. It is in the early process of being built up, and has at the time of writing 10 professors from as many different academic disciplines. More information is available at www.stromstadakademise.

Pacific Planetarium Association

Yosemite Community College is building a science community center that will house sciences for the college, including a 120-seat planetarium and a student observatory with a 16-in Cassegrain telescope. Seiler Instruments will install a ZKP4 star projector and a Quinto digital projection system. The projected opening date is the autumn of 2011. For information, contact William Luebke, luebkew@yosemite.cc.ca.us.

LA Valley College Planetarium and Observatory will undergo remodel work. The planetarium will feature a new 24-ft Nano dome by Eks/Spitz. The seats will be replaced. The observatory's 16-inch Celestron telescope will receive a new equatorial fork mount by DFM Engineering, and eight new GPS telescopes will be set up for student use. After the remodeling, those with limited mobility will be able to access the rooftop for the first time since the planetarium was built in 1963. For information, contact David Falk, www.lavc.edu.

Fremont Peak Observatory Association awarded Director Andy Newton of Hartnell College Planetarium, Salinas, "Educator of the Year" at the association's annual fundraising star party on 2 August 2008. Newton was recognized for his role in establishing and implementing the Hartnell College student internship program, where six Hartnell science students staff the observatory for Saturday evening public programs. The internship program is supported by Fremont Peak Observatory and the NASA Curriculum Improvement Partnership Award grant. For information, visit www.fpoa.net.

The Ruben H. Fleet Science Center in San Diego will have extensive renovations. The Space Theatre will be upgraded with a new dome and a state-of-the-art fulldome projection system that will allow immersive visuals and realistic simulations. They will also have the capability to develop educational content with other institutions such as the American Museum of Natural History, the San Diego Supercomputer Center and the Salk Institute. In the Science Center, hands-on exhibits as well as outreach programs will also be expanded.

Dr. Jeffrey Kirsch, executive director of Reuben H. Fleet Science Center is quoted, "In San Diego and around the world we've witnessed a tremendous growth in all areas of science and technology; growth that has led to changes that profoundly affect our daily lives. Now more than ever, it is important for the public to understand these changes and for children to embrace science at an early age. These goals we have laid out in this campaign will allow us to meet these challenges and inspire future generations of scientists and engineers." For more information, visit www.rhfleet.org.

Rocky Mountain Planetarium Association

The IPS'08 Conference was well attended by RMPA members, who used the opportunity to hold a business meeting. Dan Neafus (president) was joined by officers David Binnewies (secretary) and Aaron McEuen (treasurer), Mickey Schmidt (historian) and Mike Murray (webmaster). Mike Murray will spearhead elections to determine a new president-elect to take the reins in 2010. The other officers will retain their positions.

RMPA is in the fortunate position of having a healthy budget and of the various proposals discussed, has decided to explore a follow-up publication to the Planetarium Primer. It was agreed that the original had served its purpose and was sorely in need of updating. It was also proposed that RMPA members try to schedule some one-day regional workshops. Denver and Salt Lake City are both committed to making this happen for members in 2009. RMPA also accepted an invitation from Kris McCall to join SEPA in Nashville in 2009.

Southeastern Planetarium Association

The Western Alliance of Planetariums, comprised of GPPA, PPA, RMPA, and SWAP, will join SEPA 16-20 June 2009. The conference host is Director Kris McCall. The site is the new 18-m GPT Hybrid theater in Nashville, Tennessee. A large turnout is expected; detailed conference information is being finalized as this is written. Look for conference
details in the next issue of the *Planetarian*.

SEPA has chosen Kingsport, Tennessee as the site for the 2010 conference. Conference host will be current SEPA President Adam Thanz. The host facility is the soon-to-be-refurbished 12-m Bays Mountain Planetarium. Since this is an IPS conference year, the dates chosen for SEPA are 8-12 June, slightly earlier than normal.

**Ukrainian Planetariums Association**

The Ukrainian city Donetsk, for the short time, became the only city in Ukraine where two planetariums are being operated. After the opening of the first digital planetarium in Ukraine, the previous one (opened in 1962) with a Zeiss opto-mechanical projector was still working before being closed soon. The new planetarium has 12-m dome, six multimedia projectors with 3d BarcoReality SIM 5R system, and 84 seats. The InSpace System includes professional digital sound and visual systems, and the astronomical realtime simulator SkyExplorer and DomeManager software are being used to operate the planetarium, along with the high definition videoplayer ViPlayer HD.

Two programs are currently offered to visitors. In the near future, the administration of the planetarium plans to equip an observatory in a new building, to organize a studio for making educational movies, and to add a museum of cosmonautics. The building of the new planetarium in Donetsk was sponsored by the local business in conjunction with the city administration.

Ukrainian President Viktor Yushenko attended the official opening ceremony on 29 August. The next day, the new planetarium opened its doors to its first visitors. A real surprise was prepared for Donetsk inhabitants: a direct communication session with the ISS. Cosmonaut Alexandr Volkov, who was born in the Donetsk region, was organ-ized to attend the opening of planetarium; his son, Cosmonaut Sergey Volkov, is currently head of the ISS crew. Sergey Volkov congratulated the planetarium opening from orbit.

Dnepropetrovsk Planetarium celebrated its 40th anniversary on 19-20 September. Directors and representatives of four other Ukrainian planetariums came to greet colleagues, to discuss in a warm, friendly atmosphere activities and problems of planetariums in Ukraine and plans for future. Visitors of Dnepropetrovsk Planetarium could attend programs from different Ukrainian planetariums. A drawing, photography of a space topic, or a mockup of a space rocket served as the entrance ticket for children. The most honorable guest of the celebration was the first Ukrainian cosmonaut, Leonid Kadenyuk, who offered the planetarium his book on his space flight and delivered an exciting story about his space impressions. The lecturer who delivered the first lecture in new planetarium 40 years ago, Swetlana Levchenko, also was present at the celebration.

Dnepropetrovsk Planetarium operates a Karl Zeiss projector. Yearly the planetarium offers not less than a thousand lectures and dozens of thousand visitors attend planetarium shows. The planetarium works in close collaboration with aerospace society for youth Souzirrya, National Center for Aerospace Education of Youth, and amateur astronomers. Representatives of these organizations as well as of city governing body came to greet Dnepropetrovsk Planetarium with its jubilee.

(Fulldome, continued from page 33)
This was our first view of Centro Multimeios Espinho! (All photos by Susan Button unless otherwise noted.)
the process of organizing the next meeting, which will be held in Poland in early September 2009.

Giving Credit Where it is Due

I received an email from Ismandy Ali, who was inspired to write to me after reading my column in the September Planetarian. She referred to the story “Inspiration Under a Home-Made Dome” on page 76.

Ismandy wrote, “Hi there Susan, I am one of the few planetarians in Malaysia and have been using an old mechanical projector for star projection (15m dome) since many years back. It is really impossible for me to get donations to buy a new fulldome projector due to the daunting cost—in Malaysia the currency exchange could take us to millions—enough to buy 1-2 bungalows. Well, this is the most famous reason after all faced by many planetarians.

“But in 2006 I knew a visualization researcher [Paul Bourke] from Swinburne University, Australia, and he had a great idea: using a spherical mirror for the fulldome effect. Although I was somewhat skeptical with what he said at first, a year later, when he was in Singapore, I managed to arrange his flight from Singapore to Kuching. He came to our small planetarium in Kuching, Malaysia to tell us about the advantages of it.

“He did a demo and the results were outstanding. All of his ideas, experiences, research and everything he put on the following website: local.wasp.uwa.edu.au/~pbourke/.

“Since he came, his work has changed the face of our planetarium. Now we managed to get crowds to come back to the planetarium, thanks to his simple, yet affordable, method. His ideas give us a new look and hope.

“In case if you are not sure, all of the equipment, settings, a complete array of almost everything in your article ‘Inspiration Under a Home-Made Dome’ is found in his website and is widely known by many people.

“I did not find any credits given to him. But I agree in one thing, credits are usually mentioned in scientific writings, but for public writings, it is rarely done.

“Thanks for sharing, Ismandy Ali [Sultan Iskandar Planetarium, Kuching, Sarawak Malaysia; email curator@planetarium-sarawak.org].”

“I wrote back to Ismandy to say how happy I was to hear her success story and that Paul was such a help to the Sultan Iskandar Planetarium. I explained that I would put her story and comments in my December column. Paul Bourke, of the University of Western Australia in Perth, does deserve the credit for creating this new technological innovation. The first time I had heard of this mirror system was at the IPS Conference in Australia. Since then this technology has caught on very quickly.

Colleen McCurley, highlighted in my September column, did not come up with the original idea for a mirror system (I am sure that she built her planetarium after seeing or hearing about this technology somewhere), but I give her credit for the initiative she took and her perseverance and ingenuity. Her experience is valuable information for the rest of us.

Paul’s innovative way of projecting fulldome content has changed the market for small and portable domes by offering a low-cost alternative to the fisheye lens. As illustrated by Colleen’s experiment, anyone can build his or her own digital planetarium with the three component parts (mirror, projector and computer). The resolution of the resulting fulldome images will depend on the quality of the equipment used.

A decision must be made about the amount you can spend for the mirror, computer, software and video projector and whether the results are acceptable for your purpose. This requires some research about the available hardware and software. The nice part is that you can easily upgrade the component parts as funding becomes available. The downside is that the mirror is somewhat fragile and difficult to keep clean in a portable dome situation. I discovered at the meeting in Portugal that some clever carrying cases and projection stands have been developed to help mitigate these difficulties and a new coating for the mirror is being developed that will make it easier to clean without scratching.

Deadlines for applications for “A Week in Italy”

Although the contest for “A Week in Italy for an American Planetarium Operator” has been discontinued, there is still the chance for a French- or Spanish-speaking planetarium operator to enjoy a fantastic experience in Italy. The deadlines for applications are:

31 August 2009, “A Week in Italy for a French-Speaking Planetarium Operator.”

30 September 2009, “A Week in Italy for a Spanish-Speaking Planetarium Operator.”

For more information on the “Week in Italy,” go to www.astrofilibrasciani.it/Planetarii/Week_in_Italy/Week_Italy.htm.

Top: Simón Garcia, from Spain, explained his experiences in building “Planetariums Step by Step.” He told us that this was his first planetarium!

Next: Quim Guixa and Albert Pla from Aula de Cosmos showed us a dome that can be used for the classroom, old folks home or for exhibits.

Next: Delegates had plenty of time to network.

Bottom: António Pedrosa (right), Patricia Madeira (center) and Fabien Cheréau (left) examine the stand and carrying case for the mirror system that Patricia Reiff and Mario Di Maggio (Discovery Dome) demonstrated.
major human spaceflight project to follow the shuttle and includes development of the Ares 1 and 5 launch vehicles, the Orion Crew Exploration Vehicle and Altair lunar landing module. Assuming future administrations allow the project to continue, these vehicles will maintain America’s foothold in low Earth orbit and once again allow access to the moon’s surface more than 40 years since the last people visited our satellite. Beyond lunar orbit, Constellation hardware could play a role in human flights to Mars. Despite its importance, the project seems still all but unknown to the public, but this can only change as time goes on.

McElvea’s book very briefly covers Constellation’s political background and the Exploration Space Architecture Study which laid out the project’s requirements. This is followed by descriptions of the new hardware, with most detail on the Orion spacecraft, a sort of big brother to the historic Apollo spacecraft, and the Ares boosters, fascinating amalgams of shuttle and Saturn technology.

There are some very provisional details of the still nebulous Lunar Surface Access Module (which had not yet been named Altair when the book was published), and there is a short entry on Constellation’s robotic precursors, the Lunar Reconnaissance Orbiter and the Lunar CRater Observation and Sensing Satellite, to be launched together later this year.

The colour section features mainly CGI renderings of the vehicles, but there are also diagrams of mission profiles (including a Mars mission) and photos of components under test. The vehicle designs are still evolving; as a result, note that the book’s images of the Orion CEV no longer match the latest configuration of the spacecraft.

If you want to get up to speed on what may be the future of spaceflight, this book will be useful to you. But buy it soon: it will go out of date quickly!

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We offer a collage of fine print for your edification and delight, gentle readers. Small books packed with information, thick books full of computer code and epigrams, a volume of science fiction from the last millennium, and the latest astronomical information from this one.

With many thanks to our reviewers: Steve Case, Francine Jackson, Colin Johnston, and Angela Sarrazine.

Space Shuttle Fact Archive
Reviewed by Colin Johnston, Armagh Planetarium, Armagh, United Kingdom.

The end is now in sight for NASA’s space shuttle program. The remaining orbiter vehicles are due for retirement by 2010. Once the epitomes of high-technology human spaceflight, the shuttles are now often dismissed as obsolete, and the whole project as waste of effort, even by pro-space pundits. This seems unduly harsh; the project was oversold, yes, but it taught us valuable technological lessons and gave NASA a generation’s worth of human spaceflight. In my experience, the chunky black and white bulk of a shuttle orbiter is the only manned spacecraft recognized by the majority of public. The name Soyuz is a meaningless foreign word, Apollo a vague memory to the over-40s, Gemini and Mercury just Greek gods.

The shuttle is still important, as a symbol of human space exploration. Hopefully, on their withdrawal from service, the Atlantis, Discovery and Endeavour will inspire future generations as exhibits in museums.

Robert Godwin’s Space Shuttle Fact Archive is a member of Apogee Book’s series of Pocket Space Guides, which aim to cover “the entire gamut of space exploration in a user friendly format.” Each is a modestly-priced small paperback with 96 pages, half of which carry full-colour illustrations.

The Space Shuttle Fact Archive is exactly what its title says. If you are going to need to know something about the shuttle program quickly, you should carry this handy little volume in your pocket. If you are just interested in the shuttle as a really neat piece of engineering, you should keep it in your desk. At what altitude is the shuttle when it jettisons the solid rocket boosters? Who were the five crew members on STS-54? What are all those vehicles that surround the orbiter immediately after it rolls to a halt on the runway? All the answers are in this book, along with much more.

There are complete lists of shuttle astronauts and missions with concise statistics, annotated diagrams of components and full descriptions of two of the shuttle’s scientific payloads, Europe’s Spacelab and the lesser-known SPACEHAB. There is no soul-searching into the meaning of the shuttle or consideration of might-have-beens in this book; it is just a helpful collection of data in a handy format, and as such I find it very useful.

Project Constellation: Moon, Mars and Beyond
Reviewed by Colin Johnston, Armagh Planetarium, Armagh, United Kingdom.

Project Constellation is to be NASA’s next...
Edison’s Conquest of Mars (A Sequel to the War of the Worlds)

Reviewed by Francine Jackson, University of Rhode Island Planetarium, Rhode Island, USA.

In 1897, after H.G. Wells wrote his amazingly successful The War of the Worlds, the Earth was very wary of the Martians still left back home and sought help from the scientific community to wreck havoc on the red planet. First, and best, to step up to the challenge was Thomas Edison, whose “disintegrator” ray proved perfect for the task. Upon international agreement and cooperation, Edison, along with Lord Kelvin, Lord Reyleigh, Professor Roentgen, and all the other leading scientists in the world at the time, “placed[ed] their services at the disposal of Mr. Edison in any capacity in which, in his judgment, they might be useful to him.” For most of them, that meant helping him build a fleet of spaceships equipped with his lethal invention and accompanying him on his death charge to Mars.

Sounds like science fiction? Of course it is. After all, what nation would allow all of its greatest scientists to travel en masse to another planet, with the ultimate goal of eradicating every citizen on its surface? Oh wait—that was the original idea of the Martians.

In case you don’t recognize the author’s name, Garrett P. Serviss describes himself as the “well-known astronomical author,” although he started his working life as a member of the bar. Like many people in his day, he was fascinated with space, and spent most of his life as a fiction writer and science journalist. This book, although we might today use the word “hokey” for it, was truly a work of art for its time. His imagination also includes, for the first time in print, many science and science fiction staples of today, including his disintegrator ray, which is probably the ancestor of the ray gun or Star Trek phaser. In this first-person narrative, he has the heroes stop at an asteroid that crosses Mars’ orbit, which turns out to be a rest stop for the enemy and for which he sees the potential of future platinum mining. Serviss even uses the newly-discovered satellite Deimos as a refuge for the space travelers as they recuperate after an almost disastrous battle.

In this 2005 edition, the flavor of the book as it was written at the end of the 19th century is perfectly kept. In addition to the language, which can never be duplicated today, the book is replete with sketches showing the action as never could be imagined, including the huge, monster Martians (which reminded me a little of Gulliver’s giants; could the artist, never acknowledged, have used them as his template?), and, of course, an Earthling damsel in distress, who holds the key to Edison’s success.

Was this book fun to read? Absolutely. By the way, does Edison really save the Earth from any future Martian invasion? You can probably guess he did, but it’s up to you to read and find out how.

Titan Unveiled

Reviewed by Angela Sarrazine, Fernbank Science Center, Atlanta, Georgia, USA.

Titan Unveiled is the sequel to Lifting Titan’s Veil, but one does not have to read the first book to thoroughly enjoy the second. Titan Unveiled describes, in detail, some of the more recent events in the story of the exploration of Titan, Saturn’s largest satellite.

The book gives a well-organized history of discoveries in the Saturnian system, with coverage of how the Cassini mission has added to the scientific data set. The first three chapters present a historical account of what scientists knew before the Cassini mission, along with a discussion of what scientists hoped to expand upon.

While the book does an excellent job of recounting the scientific saga of the Huygens probe, it also has a more personal facet in the witty anecdotes incorporated throughout the text. The personal anecdotes add warmth, humor, and personality to a book that is a well-written documentary on the Huygens probe, its instrumentation and data collection.

Some of the language and descriptions in this text are not for the novice. The book includes a fair number of scientifically challenging descriptions of events that require a significant amount of astronomy or physics knowledge. However, the highly technical language interspersed within the chapters does make the book appealing to a wider audience.

Overall, Titan Unveiled is an excellent choice for anyone interested in learning what is involved in the planning and executing of a scientific mission to any of the objects in the solar system. It gives the reader a realistic view of the major events and does not fail to mention set-backs, disappointments, and errors that have to be dealt with along the way.

Calendrical Calculations, 3rd ed

Reviewed by Steve Case, Strickler Planetarium, Bourbonnais, Illinois, USA.
Calendars are important. They’re especially important in astronomy, a discipline that arose primarily as a means of keeping track of time. Once “keeping track of time” meant watching the heavens. Today it normally means checking my computer taskbar. Since its origins, astronomy has become divorced from this original purpose, and the calendars that were created from observations of the sky’s motions now seem to have little to do with them. *Calendrical Calculations* is a book that brings these topics back together.

Obviously we planetarians pay attention to calendars. We understand the incommensurability of the length of years and days, and we have a pretty good grasp on the leap year rule. We know a bit about the Gregorian reform to the Julian Calendar. We “get” time zones. Our planetariums are time machines in which we can control hours, minutes, days, and years. In my planetarium, I can display my local time or universal time as well as toggle between today’s Gregorian date and its Julian Day.

But what if I was interested in today’s date by Hebrew reckoning? Or Persian? Or Chinese? Or Islamic? I can explain how our Western calendars tried to reconcile the motions of the sky with the daily workings of humanity, but what about other traditions? What’s the difference between a solar calendar (like the Gregorian), a lunar calendar (like the Islamic), and a lunisolar calendar (like the Hebrew)? What role, if any, does astronomy still play in modern calendar system?

*Calendrical Calculations* answers these questions and many more. The book is a computational treatment of several current and ancient calendar systems. While it contains enough historical and non-computational information to be of interest to the casual reader, its primary audience is programmers interested in coding that can convert between dates of various systems. In the growing realm of digitization, I can see this being helpful to planetarians who wish to incorporate this information to be of interest to the casual reader as well as being reminded that June 6, 2008 A.D. is known by many other names throughout the world.

**The Story of Science:**

*Aristotle Leads the Way*

*Newton at the Center*

*Einstein Adds a New Dimension*  

Reviewed by April Whitt, Fernbank Science Center, Atlanta, Georgia, USA.

I could spend an entire column on each of these books separately. They are just wonderful. I read about them in a National Science Teachers Association publication and was able to obtain a set for the science center. Written with a vocabulary that middle school students could easily follow, Hakim’s sharp wit makes these a most enjoyable read for anyone. The books trace what we know and how we know it, from the earliest sky watchers connecting stars into constellations to quantum mechanics and chaos theory.

In the second volume, author Joy Hakim tells her readers, “Like all good scientists, Newton understood that he was involved in a
quest that can never be finished. He knew that his work would get trimmed and topped...science keeps building, and when new blocks are put in place, that often means throwing out or adapting it before heading on - to new heights. So there's nothing dull or static about science's story. It's a tale of exploration, one that will stretch your mind to its limits.”

The questions I'm getting from people at the end of planetarium programs or by phone reveal a real lack of basic science understanding. The quasi-hysteria a few months ago about the Large Hadron Collider creating a black hole and swallowing Switzerland is an example.

For those of us answering questions from the general public, these books are rich resources. The first volume can be a bit over-stimulating. The excellent text is surrounded (and sometimes almost interrupted) by images, sidebars, factoid boxes, type and graphics of different colors. The second and third volumes seemed gentler on my eyes, while still full of attractive images and graphics.

In *Aristotle Leads the Way*, author Hakim traces scientific thought from its roots in early people's observations of the world around them, such as by notchimg animal bones to track lunar cycles, noting seasonal star patterns, and making the leap from “This is the way it is” to “What makes it this way?” Colorful maps and timelines appear throughout the book. Sidebars provide background. The humorous tone will keep readers young and old entranced.

Galileo and his insistence on repeated experiment and careful observation star in *Newton in the Center*. He's followed by Kepler and his ellipses, Descartes and his coordinates, Newton and his calculus (that Liebnitz discovered at nearly the same time and published earlier), Roemer and his clocks, Mendelev ordering the elements on a periodic table, and all the experimenters with heat and gases and temperature.

**Einstein Adds a New Dimension** in book three. In the introduction, one of his quotes, “Imagination is more important than knowledge,” is followed with “But...Einstein had solid Germanic schooling to feed his astonishing imagination.” The author tells her readers “Start with information, ask the right questions, apply some imaginative leaps, and you are on the path to creativity.”

She also cautions, “The twentieth-century was an age of specialization. But in today’s information-based world, broad thinking has become essential. To not know science means being out of touch with the basic ideas that underlie our fast-paced existence. It also means missing out on some of the most exciting creativity in human history.”

This third volume explores relativity, magnetism, radioactivity, quantum electrodynamics, and the paradoxes and colorful characters surrounding them. There's a detailed time line of events from 1932 to 1939.There are political cartoons. There are discussions of war, peace and the Bomb. There are images of painting by Magritte and Dali. There are images from the Hubble Space Telescope. There's entanglement and locality, *The Fly and Star Trek*. And it’s all described clearly and simply.

If you have a library at your facility, it needs these books. When teachers ask for suggestions about what their students should read, recommend these books. If you're looking for some background for that International Year of Astronomy press release, refer to these books. *The Story of Science* series is a must-read.☆
organ. Each time the lamps fired, I could feel the heat of those jack-o-lanterns burning on my face, like getting to close to the sun! Rick passed while doing what he also loved, getting ready to fly his own plane. Now he’s up there soaring through the night skies closer to what he loved. And we are all better for having known him.

People On The Move
Kathryn Miller is the new planetarium director at the Robert H. Johnson Planetarium in the Jefferson County School system in Colorado. She takes over for Jim Beaber, who is retiring after 14 years at the planetarium. Miller is a recent Fulbright scholarship recipient who spent the summer studying in Egypt. She had been with the school system for 26 years and has been a campus supervisor, a library media technician, and also a social studies teacher over the course of her teaching career. The facility sees over 40,000 student visitors each year.

Gary Lazich has left his position as manager of the Russell C. Davis Planetarium in Jackson, Mississippi effective September 30, 2008. He and his wife Cindy have moved to a northwest suburb of Chicago, where they will be closer to family and where they plan to find teaching jobs. After 13 years at Spitz, Inc. in Chadds Ford, Pennsylvania, Director of Sales Al Wells retired in October (you never know, he may crash the next hospitality suite if there is Coors Light in the tub). Taking his place with sales is Jeff Whiteside.

A Song for Florida Planetariums
Dr. Norman Dean, science educator, recently composed a song extolling the wonders of Florida skies titled “Gift of the Florida Sky.” The song runs about 3 minutes in length and would be appropriate for any Floridian who would like to create a good dark/light adaptation sequence or a slide show addition for a show for tourists. Contact Norman via email at DeanPLTM@aol.com and he’ll be happy send any Florida planetarian a free CD copy and sheet music for your use. The song is performed by Brent Evans in a somewhat country-western style.

Although he is retired now, Norman still does an occasional planetarium program for the Watson-King Planetarium at Towson State University in Towson, Maryland and for the Undehill Planetarium at the Maritime Institute of Technology in Linthicum Heights, Maryland. Norman now winters in Florida, and you may remember his popular comic “Dr. Krocter” that appeared in previous editions of the Planetarian.
Brown. You can read the whole story on page 19 at www.swapskies.org/GWO_Issues/GWOWinter2008.pdf. You can also see the original article at www.gi.alaska.edu/ScienceForum/ASF1/186.html, and if you Google “Stegemeyer Sputnik” you will see various articles, including tech.groups.yahoo.com/group/OAOG/message/9334, which is the Associated Press article on placement of the plaque.

If you’re interested in auroras or other Alaskan related subjects, visit www.neildavisalaska.com and www.alaskascience.com.

Monthly IYA Discovery Guides Now Available

On October 31, 2008, the Astronomical Society of the Pacific unveiled its International Year of Astronomy 2009 Discovery Guides! These monthly guides are internationally accessible and come complete with articles, hands-on activities, and finder charts. The ASP, Night Sky Network, NASA, the IYA USA Committee and the National Science Foundation are teaming up to provide a full program to celebrate IYA with the rest of the world. They will also provide a fully searchable online database of Night Sky Network activities and other astronomy resources, with many accompanied by online videos and a calendar of worldwide and nationwide astronomy events for you to celebrate.

You can preview the January IYA Discovery Guide at nightsky.jpl.nasa.gov/download.cfm?Doc_ID=300. The effort commemorates the anniversary of Galileo’s first use of his telescope to observe the universe.

The ASP reports it is grateful for the support from the NASA Science Mission Directorate, Space Telescope Science Institute, the Origins Forum and the National Science Foundation to make these Discovery Guides and other ASP IYA activities possible. You can learn more about the ASP’s IYA activities and programs online at: www.astrosociety.org/iya and the US IYA initiatives at astronomy2009.us.

Book ‘em Dan-O!

Long time planetarian Dr. Thomas Wm. Hamilton of the HOSS Planetarium in Staten Island, New York, and author of the Planetarium’s 25 Years Ago column, has just released his latest book, titled Time for Patriots. It is his first work of fiction and has been highly praised by reviewers. The story involves a military academy thrust through time by a science fair project gone awry! It can be purchased through a variety of sources, including Amazon.com and BarnesandNoble.com, or order directly from the publisher at www.strategicbookpublishing.com/TimeForPatriots.html.

Grab Bag of Goodies Available Online

The National Science Teachers Association has a huge list of links to cool science classroom activities on their website at www.nsta.org/publications/grabbag.aspx?lid=pub. Topics range from Mars Rover activities from the Mission:Space attraction at the Walt Disney World Resort at disney.go.com/vacations/missionspace/ms_mainflash.html to the Earth from Space online exhibit from the Smithsonian Institution at www.earthfromspace.si.edu. Other topics include activities about meteorology, hydrology, botany, geology and paleontology and from other organizations like the Junior Engineering Technical Society, the U.S. Geological Survey and the U.S. Department of Education.

One unique website called Schoolyard Geology compares the schoolyard to a geological field site. This program was created by USGS scientist Matthew d’Alessio, who originated a similar program while teaching geology to inmates in San Quentin State Prison in California. After discovering how the prison yard could become a geological field site, d’Alessio developed this online resource, education.usgs.gov/schoolyard/, to explain how students can conduct a geologic field trip in their own schoolyard or backyard.

Congratulations to...

...the Indian Space Research Organization (ISRO) on the launch of their Chandrayaan-1 Moon Probe from the Sriharikota Space Center in southern India on October 22, 2008! Sensors on board the probe were developed by Raytheon and will be used by Indian scientists to determine whether there is ice on the moon. You can visit their website at www.isro.gov.in. Riding atop the Polar Satellite Launch Vehicle, the probe entered into high Earth orbit on October 26 to start a two-year mission. It will be using eleven scientific instruments built in India and five other countries to study the Earth’s only natural satellite.

...Suzanne Gurton, the education manager at the Astronomical Society of the Pacific on receiving the 2008 Professional Award, given each year by the Astronomical Association of Northern California to an astronomer who has done outstanding work in distinguishing and fostering amateur astronomy. A member of the team at the ASP for the last eight years, Gurton has been creating and writing activities, holding workshops for a wide range of educators, and, more recently, managing the staff of the entire education department at the 120-year old ASP.

As an astronomy educator, she has spearheaded several major national educational initiatives that benefit the amateur and educational communities in astronomy, including the Night Sky Network project (done in cooperation with JPL and several NASA missions), in which members of over 200 astronomy clubs around North America are being supplied with education and outreach kits and being trained on how to do school and public events with them. Recognized by NASA as one of its most successful educational projects to date, they continue to support and expand it.

(Continued on next page)
Ronald Parise, 56, astronaut and space shuttle astronaut, passed away May 9, 2008 after a three-year battle with brain cancer. Born May 24, 1951, in Warren, Ohio, Dr. Parise received his bachelor of science degree in physics with minors in astronomy, geology and mathematics from Youngstown State University in Youngstown, Ohio in 1973. He received his PhD in astronomy from the University of Florida in 1979.

After receiving his PhD he joined Computer Science Corporation, where he worked on the development of a new space telescope, the Ultraviolet Imaging Telescope. In 1984 Parise was chosen as a payload specialist for NASA’s ASTRO program. The purpose of the ASTRO flights was to fly the Ultraviolet Imaging Telescope and two other ultraviolet telescopes from the bay of the space shuttle. The Earth’s atmosphere absorbs ultraviolet radiation making ultraviolet astronomy impossible from the surface of the Earth.

The maiden voyage of the ASTRO telescope package was planned for 1986, but the Challenger explosion delayed the launch until December 1990. During the ASTRO-1 flight Dr. Parise and three other astronomer astronauts observed 135 celestial objects: stars, double stars, star clusters, galaxies, Jupiter, Comet Levy and the 1987 Supernova in the nearby galaxy the Large Magellanic Cloud. On the first flight Parise and his colleagues were in orbit for 215 hours.

The second mission in 1995, ASTRO-2, set a record for the longest shuttle flight with a duration 399 hours (sixteen and a half days). One of its accomplishments was detecting intergalactic helium, confirming one of the major predictions of the Big Bang Theory. Dr. Parise logged 614 hours and 10.6 million miles in space during these two missions.

After the completion of the ASTRO Program he worked on advance planning and communication engineering support for space flight and engaged in astronomical research using ground based telescopes and space probe data.

Parise’s interest in science began at an early age. He became a licensed radio operator when he was 11 years old. In his teens he became an active member of the Mahoning Valley Astronomical Society, the local amateur astronomy organization, and learned to pilot an airplane. While at Youngstown State University he assisting in developing and presenting planetarium shows and ran telescopes during public nights at the observatory.

Survivors include his wife of 34 years, Cecelia Sokol Parise of Silver Spring; two children; his parents, Henry J. and Cathryn A. Parise of Warren; and a sister.

Richard Pirko, 55, producer-technician at the Ward Beecher Planetarium at Youngstown State University in Youngstown, Ohio, passed away quietly the morning of October 15, 2008, the result of an attack of cardiac arrhythmia the week before.

The following was written by his good friend, Dr. Ray Beiersdorfer of the YSU Department of Geology and Environmental Studies:

As a passionate educator, Rick spent the past three decades providing science outreach as the producer/technician for YSU’s Ward Beecher Planetarium. In addition to his public and school programs, he supervised and mentored numerous college students, providing them with one of the most important educational experiences of their lives.

As an accomplished photographer, Rick’s aerial photographs of the Serpent Mound Archeological Site have been published by the Ohio Historical Society and displayed at The British Museum in London.

As a licensed pilot and co-owner of an aircraft Rick provided hundreds of children between the ages of 8 and 17 their first flight as a local organizer of the Experimental Aircraft Association’s (EAA) Young Eagles program.

Rick was a Merit badge counselor for the Astronomy and Aviation Merit Badges for the Boy Scouts of America.

As supporter of the arts, peace, social justice and the environment, Rick provided photographic and technical assistance to the YSU Department of Theater and Dance, the Oakland Center for the Arts, the Ohio Supermaximum Players, the Valley Coalition for Peace and Justice, and the YSU Recycling Center. He was a co-creator of Dr. Ray’s Amazing Sideshow of Science which merged the worlds of sideshow and science as a fun way to teach critical thinking and skepticism. He and his wife, Victoria, grew organic vegetables and raised and trained dressage show horses on their 65-acre farm in Trumbull County, Ohio.

In addition to his wife, he is survived by his mother and four brothers. Plans are underway to construct a permanent sundial in his memory.
Under the Weather

“Sesame Street in Outer Space”
- The New York Times
This issue opened with a letter from Bill Gutsch, then the director of New York's Hayden Planetarium. He asked for materials that could be incorporated into a planned half-hour video documentary on planetariums. A second letter, from James Rusk, returned to the creationist topic from the June issue, warning that “Americans are incredibly ignorant about science,” and warning that “most planetarium programs would not be acceptable to creationists.”

Sally Ride’s venture into space led Shirley Harrison (Nassau County College Planetarium) to write an article on “Women and the Stars.” In addition to Ride, she mentions Linda Morabito (Io’s volcanoes), Reta Beebe (Saturn’s “ring spokes”), Winifred Cameron (Jupiter’s rocks), Nancy Ronan (Yerkes and Hubble Space Telescope), Hypatia (astrolabe), Caroline Herschel, Dorothea Klumke, Henrietta Leavitt, Annie Cannon, Maria Mitchell, and many others.

John C. Pogue (Grand Prairie Independent School District Planetarium) reported a new product for making slides. The times, they have a changed...

Earl Everett (Fleischmann Planetarium) recommended a Kodak film as an alternative to Kodalith or opaquing. Quelle est le film d’antan?

The much-missed Claire and Quent Carr of Herkimer Planetarium described the first three of six planned laser disks. The first group covered Voyager, Apollo, and the early Shuttle. Since laser disks were, like the Shuttle, pretty new in 1983, the Carrs explained what laser disks were, the different types, and how planetariums could control them.

Norman Sperling (then at the Morrison Planetarium) provided a list of 40 books every planetarium should have available. A couple were so old that they might still make such a list, such as Elijah Burritt’s Atlas to Illustrate the Geography of the Heavens (for those into classic constellation figures), or J. Norman Lockyer’s Dawn of Astronomy. His recommendation of a good college text would probably still hold, although the list of such texts and their content will have changed. Someone might want to create a modern equivalent list, although such books really needed in a day with Internet links to NASA, observatories, and other sources?

Sperling also listed essential periodicals, books on observing, and such side issues as the Guinness Book of World Records and a refutation of Immanuel Velikovsky.

Charles Hagar (San Francisco State University) outlined questions he proposed to ask in a new survey of the world’s planetariums.

The Script Section, then run by Lauray Yule, had the script and an article for the show Squinty the Squirrel, a children’s show on lunar phases. This show was written by Betty Whitehouse, then the director of the Sayville (Long Island) Public Schools Planetarium. The show was presented at the IPS meeting in Vancouver in 1982 and was a real charmer.

Jeanne Bishop’s President’s Message reported on an IPS Council meeting in the Universe...that’s the Science Museum of Virginia’s Digistar, the first one to be installed. The 1986 IPS meeting was announced for the Flandrau Planetarium, quite remarkable considering the controversy about the Flandrau in the September issue. The laser disk project was being dropped, and Now had no plans to do a show on planetariums (they still haven’t). Institutional memberships in IPS were newly created, to start in 1984.

The Awards Committee was finally up and running, under Bruce Dietrich. A Crisis Action Committee was to have been set up, but seems never to have functioned. IPS President-Elect Alan Friedman was working on an IPS membership brochure in five languages.

John Wharton’s Gibbous Gazette opened with an appreciation of the recently deceased George Abell and his career. John also previewed some of what to expect at the IPS 1984 conference in Monterey de Mexico. (He did not mention the small sample bottles of tequila that attendees were to receive.) There was more information on the cancellation of the laser disk project. Spitz was reviving its summer institute with George Reed in charge. Competing, the Strassenberg Planetarium was running a producers’ seminar in the summer.

The American Chemical Society was funding a show on Comet Halley, written by Mark Littman. Loch Ness Productions had a show timed to NASA’s 25th anniversary (did anyone do a 50th anniversary show this year?). Strassenberg was also offering a Halley show, while the Chaffee Planetarium was reviving the “comet pills” so popular during the 1910 apparition. These came with a card warning “the museum surgeon general has determined that worrying about comets is hazardous to your health.”

Saudi Arabia’s STS, reportedly sitting in crates since 1976, may actually open. The Leverrier Planetarium in Trois Riveres, Quebec would soon open with the A3P recycled from the Kirkpatrick Planetarium. Other new installations were at Bowling Green, Roanoke, and Florence, Italy. Various personnel shifts were noted, and Bill Gutsch of the Hayden was chair of the committee vetting proposals for use of the Amateur Space Telescope. The Right Stuff was rapped for having stars twinkle while viewed in outer space. There was a lawsuit by the Hummel Planetarium over problems with their STS.

This issue saw John Moseley begin his long running Computer Corner, rating and critiquing astronomical software.

Eric Melenbrink was running Creative Corner, in which Joel Maas (Schreder Planetarium) suggested promoting your planetarium with an easily-(?) built model of your star projector.
December 2008

Planetarian 91

**Planetarians’ Calendar of Events**

2009

**International Year of Astronomy**


2-5 April. 100 Hours of Astronomy. This is a cornerstone project for the International Year of Astronomy. 100 Hours of Astronomy is a round-the-clock, worldwide event with 100 continuous hours of a wide range of public outreach. For more details go to: www.astronomy2009.org.

18-19 April. Italian Association of Planetaria (PLANIT), XXIV National Conference, Naples, City of Science, Italy. www.planetaritaliani.it. Contact: osservatorio@serafinozani.it.

15-17 May. Annual General Meeting of the British Association of Planetaria (BAP). Contact: Shaaron Leverment, shaaron@explorerdome.co.uk.

16-17 May. Australasian Planetarium Society’s APS meeting, Mt. Cook in New Zealand.

16-18, May. Meeting of ADP, Arbeitsgemeinschaft Deutschsprachiger Planetarien (Association of German Speaking Planetariums), Mannheim Planetarium, Germany.


11 July, total solar eclipse


Deadlines for “A Week in Italy”

31 August 2009. “A week in Italy for a French Speaking Planetarium Operator”.

30 September 2009. “A week in Italy for a Spanish Speaking Planetarium Operator”.

For more information on the “Week in Italy,” go to: www.astrofilibresciani.it/Planetari/Week_in_Italy/-Week_Italy.htm

For corrections and new information for the Calendar of Events, please send a message to Loris Ramponi at info@serafinozani.it.

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.

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**Immersive Film Festival**

**Navegar Foundation Espinho, Portugal**

24-26 April 2009

Centro Multimeios Espinho

The Festival is an event that will gather international productions in the Immersive Cinema field. It is an open invitation to all, including producers, animators and filmmakers, artists, students and teachers in order to participate in this unique event. IFF will be focused on presenting productions in this media, along with a competition among submitted productions that made its debut recently. Besides the competition and the public screenings, workshops for young artists and public talks will be organized to promote immersive cinema. Special screenings for primary and secondary schools will also be organized. It is intended to be a space to captivate active members of cinema in general into this new media, a space to discuss ideas and to create partnerships, and above all, to work as a catalyst to the development of this area of cinema.

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22 July, total solar eclipse

4-5 September. Nordic Planetarium Association Conference, Jaermuseum, Vitenfabrikken, Sandnes, Norway. Chair and contact: Ivar Reed Nakken, ivar.nakken@mail.nu.


2010


11 July, total solar eclipse

One of the fun parts of our profession are the thank-you notes from school classes (or the general public). An academy in our county asked if I would bring the STARLAB down for two days of space this fall with their second graders.

The science curriculum standards list stars of different colors and sizes, constellations, and geometric patterns for this age group, so we started with the Summer Triangle in the evening sky, reviewed rotation while moving to the early morning sky, found the square of Pegasus and a rectangle along the Gemini twins, and ended with a large triangle of red, white and blue stars (Betelgeuse, Sirius, and Rigel).

A few days later, a packet of thank-you notes arrived through the county courier system. On several, the students had drawn triangles with red, white and blue dots at the vertices. Many included rainbows, hearts, and representations of the inflated dome.

Do you know how you could tell what directions the teachers gave? One of the notes read “Write 1 thing you like. I love the stars.” That note wasn’t signed, but the next one was. Edwin wrote, “I like bikes.”

Keith Johnson shares more thank-you notes from his planetarium in Glassboro, New Jersey:

“That place was educated.”
“Thank you for filling my brain with goodies!”
“I learned a lot about planets…and that Plutos the biggest planet.”
“Thank you for allowing our Craniums to expand.”
“I know that Pluto is the coldest planet, but it is making me cold saying it.”
“Some of the stuff you taught me I didn’t know. But, when you taught me I knew it.”
“Thank you for showing us the planetarium. It is very big” (and we only have a 40-foot dome)
“I leaned that the galaxy is bigger than I thought.”
“It was really cool when the ceiling was turning.”
“You taught us a lot about space it was cold and funny.”
“At first, I didn’t have interest in the stars, planets etc. but now I have many wonders.”
“Thank you for letting us come to the astrotream. It was very long. I almost fell asleep.”
“I might visit the planetarium again.”
“I hope we can come again next time. If we can I will be the first one to wave at you.”
[Overheard on her way out] “I want to stay here forever!”
[Two boys came slowly into the dome while I was working; one pointed at the dome, illuminated in sky blue] “What’s that?” “That’s God!”
[Overheard from a girl on her way out] “I can’t wait to go to college!”
“I got dizzy when the walls moved.”
“When you rotated the sun I got dizzy.”
[and I didn’t move anything all that fast] “Did you know we are so small you will be scared? I do not really like that. Do you?”
“do you know all the galaxies I don’t I know all the planets.”
“...one thing really scared me you said the sun was going to blow up! I know its 6 billion or trillion years from now but I’m still scared. Are you worried are you its really scary that it will happen I thought god are father controled are soler systume. Would he actually kill us all!!! If he did it would be very suprising!”
“My favrot part was The Seacrot of the Card bord roket! It was hot and col!!!!!!!!!!” [Yes, 15 exclamation marks]
“I think after that trip I want to become an astrunat.”
“I was surprised to see how much stuff I learned.”
“And I didn’t know that ‘Beatljuice’ was a word.”
“I know that the sun wasn’t a star... That was my fourth time coming there.”
“I already knew that mars was very hot.”
“Now I know more!”
“My favorite part was when we were spinning around in circles.”
“I’m going to be a scienctist when I get older like you I’ll be like you, except I’ll be a girl not a boy.”
“From, Chris (the alien kid)”
“Astronomy rules!” [more than one student in one class]
“Thank you... Sincerly, Alec. P.S. I probaly didn’t spell sincerly right.”
“I learn that Jupiter has a storm... and it was called the red spot because its red and it’s a spot.”
“I loved all of the colors from The Solar System.”
“I like the picture you did for me so I can be smrt...”
“I hope you had as much fun as we did.”
“It was nice to tell us about the space time continuum.” (impressive, except that “continuum” had some kind of extra loop between the u’s)
“You shod be an astronot.”
“Will you teach me more?”
“P.S. I like space now.”

A radio announcement... an excited phone call... and our sly gunshoe, Skye Watcher, is on the case. Explore with Skye and discover what happened to the ex-planet Pluto as she tracks down clues that stretch back hundreds of years! Audiences will have great fun with this brand-new, unique program that looks into the changing status of planets in our Solar System.

We’re proud to present this program for public leasing at an affordable price. You will receive all the digital content on DVD complete with video, soundtrack, digital still visuals, script, and much more.

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