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# PLANETARIAN

Journal of the International Planetarium Society

The many spheres  
of IPS



## Out with the Old - In with the New



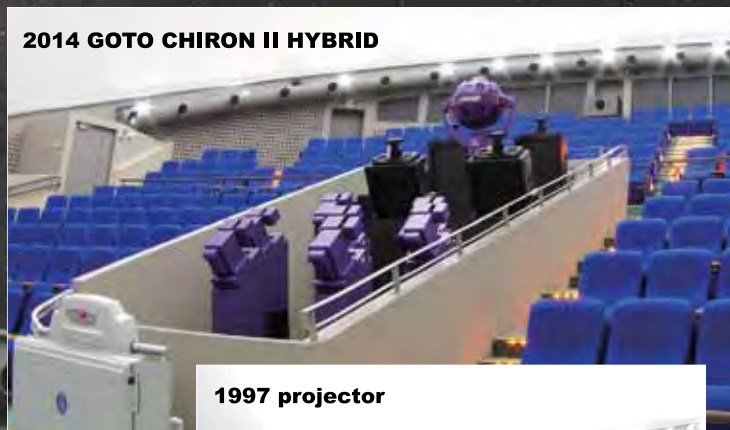
Nagasaki is a 400 year-old port city on the southern Japanese island of Kyushu. For centuries, it was one of the principal cities where Japanese culture interacted with European and other Asian cultures. As such, it has always been a city that is curious, and eager for learning and new ideas.

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March: January 21  
June: April 21  
September: July 21  
December: October 21

### On the Cover:

Celebrating the diversity of the International Planetarium Society: Clockwise, from upper right: Dennis Simopoulos, who just retired from the Eugenides Planetarium in Athens, Greece; see more on page 65.

Minnesota State University Planetarium Director Dave Weirich, aka "Laser Dave," and the staff of the planetarium presented shows to over 900 people during their Laserfest 2014 event. Photo by Nicholas Watson.

Sea plants in dome view at the innovative program *Plants of the Ocean*, an audio-visual installation at the Steno Museum Planetarium at the University of Aarhus, Denmark. Photo taken by Peter Bondo Christensen; see more on page 20.

Planetarium Torreón, Mexico, with its impressive Saturn ring architecture. Photo by Eduardo Hernández; read more on page 63.

A 3D show in the Planetarium La Coupole, Helfaut, France. Courtesy of Julien Cadez/La Coupole. More about this fascinating museum appears on page 62.

Vlad Dolgov attempts to manipulate the gloves of space-suit Orlan during activities at Nizhny Novgorod Planetarium, Russia. Photo by Uliana Avdeenko; more on page 70.

Fiske Planetarium's retired optomechanical starball, now on display in the lobby of the Boulder, Colorado, planetarium. Photo: Phil Groce.

Center: Uniview render from a Worldviews Network presentation showing a panoramic photo "bubble" of Mt. Everest. Photo by Ka Chun Yu; see more starting on page 47.

Background: Hubble Space Telescope image of a small part of the giant stellar stream of the Andromeda Galaxy. NASA, ESA and T.M. Brown (STScI)

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Two-hundred and eighty-three. 283. That's a lot of years of experience accumulated by seven planetarium professionals who are marking retirements in 2013 and 2014—and those are only the ones I have heard about.

We should feel honored that our profession draws such a level of commitment and passion that these planetarians devoted an average of 40 years of their lives under the dome, teaching and sharing with hundreds of thousands of people.

Six of the retirees are featured in this issue of *Planetarian*:

- John Cotton, Fair Park, Texas, retired in 2013 after 48 years in the field (page 72);
- Dennis Simopoulos, Eugenides Planetarium, Athens, Greece, 47 years (page 65);
- Glen Moore, Wollongong, Australia, 44 years (page 32);
- Dale Etheridge, College of Southern Nevada, Las Vegas, 38 years (page 33);
- Sheldon Schafer, Peoria Riverfront Museum, Illinois, 38 years (page 66, plus page 72 in the March 2014 *Planetarian*); and
- Larry Mascotti, Mayo High School Planetarium in Rochester, Minnesota, 37 years.

The seventh is Dave Weinrich, IPS past president, who retired from Minnesota State University-Moorhead after 31 years. I learned of Dave's retirement through personal correspondence.

I also need to include Sue Peterson, planetarium director at the Science Factory Children's Museum and Planetarium in Eugene, Oregon, who announced her retirement via Dome-L.

The next time you see any of these colleagues, take a moment to stop, shake their hands, and tell them "thank you" for their dedication to the dome and the work we do under it.

### Hydrostatic equilibrium

The cover of this issue was fun to put together. I had many excellent images to choose from (the majority from IPS affiliates for International News), each telling a different story.

Then I realized that they also illustrate the many different types, settings, and people of planetariums around the world, all with the same mission: to share the wonders of the uni-

verse with the public. The latitude and longitude from which they work doesn't matter, because we all share the same sky.

The types of planetariums are also illustrated by the retirees mentioned earlier: they represent large and small science museum, university, and school planetariums, including one whose facility does astronomy only with mobile domes.

To draw an analogy with the stars, the planetarium field can be described as being in a state of hydrostatic equilibrium, where the expanding gas—our diversity—is balanced by the binding force (gravity) of our passion of sharing the universe.

Basically, gravity pulls in while gas tries to escape, and equilibrium is reached when the two are balanced. Any upsets to the balance can lead to the death of the star.

The International Planetarium Society has been serving as the core of our hydrostatic system, pulling toward itself the "mass" of the different "gases" that make up the planetarium field.

I would love to see the core of our society grow in mass so that we transform from a red dwarf star, large enough to sustain nuclear fusion and long lived, but not very active or exciting, to become at least a yellow star, a stable society with enough members to be a solid, steady, relatively long-live force that keeps the planetarium field in balance.

To grow, we need more mass. We need to recruit, for example, the many school-based planetarium people who don't have the time, interest, or financial support to join a society that doesn't often touch on their facilities.

I have only one data point for that statement, a local high school planetarian whose dome is his classroom and the pressures of teaching and raising a young family place the IPS low on his priority list. Regardless, I think he is representative of many of the school planetarians out there.

We also need to appeal to the many different types of planetariums in existence, and serve their needs the best we can.

### Who needs all the drama?

We also need to personally rein in the drama sometimes acted out on Dome-L.

Notice I said "rein in," as in exercising control and restraint, not stop. I would be the last person to ever suggest that our basic human right to free speech (at least that's a right we enjoy and abuse in the United States). Dome-L is our forum, our connection to our peers around the globe, and a place to blow off steam and ask for advice. It's the neighborhood bar, if you will, where everyone knows your name.

Sometimes, however, strong personalities and opinions clash and erupt into verbal barroom brawls that leave the participants with black eyes but no resolution to the issues being discussed. No one wins—and, more importantly, no one person or point of view is able to ever "win."

The purpose of planetariums, the use of technology, the supposed glory of the "good old days," are all topics that spark debate and needless spats. These are all just eddies in the gas cloud that surrounds our central core, perhaps resulting in dark spots.

But the increasing vitriol, especially in a society that, unfortunately, is coming to value personal beliefs more than science, could do more than create eddies: it could be the disaster that tears our star apart.

No one wants our star to supernova, nor do we want our society torn apart by outside forces, or by inside forces not concerned with the good of the whole.

The IPS officers have been working on a plan called Vision 2020 to help ameliorate some of the difficulties of leading, serving, and providing benefits to planetarium professionals. President Thomas Kraupe has been sharing different aspects of Vision 2020 in his column, and it will be discussed at IPS 2014 in Beijing.

Stay tuned for more details.

### Our strength in diversity

Getting back to the cover, this issue also illustrates our strength though diversity and the creativity within our field. We have stories about reaching out to underserved populations (shows for the vision impaired in St. Louis and for the deaf in Mumbai), how a multi-cultural and multi-language program was born and has prospered (Big Bird as a full-dome star), using the dome's environment to teach in other disciplines (an audio-visual project under the sea, geosciences); and historical astronomy (John Quincy Adams and the Great Comet of 1811).

Each shows how we use the dome to teach and inform, to provide an aesthetic response to hard-to-understand issues, and take advantage of the technology we have available to achieve our missions.

After all, the Vandalia Planetarium (Smith Middle School, Ohio) drew 100 people for a program in a dome with 66 seats and whose technology is 40+ years old. Mission success. ☆



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## President's Message

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### Dear Fellow Planetarians:

While you read this in June, our big IPS gathering—the 22nd biennial conference in Beijing, China—is only a few days away. IPS 2014 is attracting planetarium professionals from around the world and I do hope to see you there June 23-27! Please consult the conference website at [www.ips2014.org](http://www.ips2014.org) for late-breaking details.

Please understand that this current president's message was written in very busy times and hence is considerably shorter than usual, with just some bullet points for you to look after.

### IPS 2014 Elections

The call for nominations for president elect, secretary and treasurer for 2015-2016 will close at the IPS2014 business meeting in Beijing, with the last chance for nominations from the floor. Please contact Martin George, chair of the Elections Committee, at [martin-george3@hotmail.com](mailto:martin-george3@hotmail.com), if you have any questions about this election. More information is posted on the IPS Website and on the the IPS Election Committee pages.

All members will be informed about the candidates and voting will start in September via electronic ballots on our website. You will be notified about that soon after the IPS 2014 conference.

### Bids for hosting IPS 2018

Who will be hosting the 24th IPS conference, after IPS 2016 in Warsaw? We will not know until IPS council votes on that in 2015, but we will know the candidates for 2018 because they will present their bids at IPS 2014 in Beijing.

Hence, if you are attending IPS 2014 you will be able to see the presentations first hand, ask questions, and meet with potential hosts face to face. All the presentations also will be distributed and reprinted in upcoming issues of our journal. I am thrilled about what could once more be a great international competition in the best spirit of IPS!

### Keynotes at IPS 2014

Let us look again at IPS 2014, since it will be an unprecedented chance to learn about astronomy, science education and culture in

Asia, and in China in particular.

I am really pleased about the lineup of keynote speakers for IPS 2014, which includes Mr. Ouyang Ziyuan, former chief scientist of China's lunar exploration program; Mr. Sun Xiaochun, leading scientist on Chinese Ancient Astronomy; and Prof. NAME Samus of the Steinberg Institute at Moscow State University and chair of Eurasian Astronomy Society, who will talk on astronomy and astronomy education in Russia and nearby countries; and David J. Eicher, whom most of you know as editor-in-chief of *Astronomy* magazine, the world's largest publication on the subject.

Dave is also president of the Astronomy Foundation, the telescope industry's first-ever trade association, and author of 17 books on science and history. In his keynote talk, Dave will speak about "Communicating Astronomy in the 21st Century" and discuss the increasing challenges and complexity of communicating planetary science, astronomy, and cosmology in the fast-paced modern world we now live in, with many younger people awash in a continual world of entertainment and with new modes and methods of getting science out to the public.

His talk will describe exciting current developments, the new worlds of social media and digital publishing, and the challenges to spark interest in planetaria.

Dave and I are already exploring how IPS and *Astronomy* magazine can cooperate in this area and how this could give planetariums greater visibility. We intend to record Dave's talk (and all keynote talks and other major events at IPS 2014) and make it available via download from the IPS member-only pages. This will be especially useful for those members who unfortunately could not attend our IPS Conference this time.

As usual we certainly will also gather the majority of the presentations in writing in our proceedings, which will be made available to our members as a digital publication.

### Fulldome Awards at IPS 2014

In just a few days, on June 25 at IPS 2014 in Beijing, we also will present jointly with the Macao Science Center the first Fulldome Awards Night, featuring the winners of the IPS-Macao International Fulldome Festival.

The jury had a record-breaking number of 68 productions from all around the world to review and finally selected 30 fulldome films for the competition. Winners will be announced also on our website and in the next issue of *Planetarian*.

### Sessions by IPS Committees

Another new feature of IPS 2014 will be sessions by IPS committee chairs surrounding the tasks they are working on for the benefit of IPS members. Among others, this includes a panel session on "So you want to build a planetarium—a 2014 update" by the new IPS Planetarium Design and Operations committee chaired by Ian McLennan, plus a session on "Data to Domes" by Mark Subbarao, chair of the IPS Science and Data Visualisation Task Force.

### New Tasks, New IPS Committees

There are two new IPS ad hoc committees beginning their work at the conference in Beijing.

Mark Webb the Adler Planetarium (Chicago) chairs "Live Presentation under the Dome" and will orchestrate workshops devoted to this important subject, which could evolve to form a pillar for professional development in our Vision 2020 strategy.

Rene Rodigast, audio researcher at Fraunhofer Institute for Digital Media Technology, Ilmenau, Germany, will gather interested IPS members and experts for defining requirements on sound and acoustics in planetariums.

Based on upcoming discussions at IPS 2014 and thereafter, an IPS committee will be formed and start to focus on high quality audio in the dome. This will include topics like room acoustics, spatial sound quality and acoustical immersion, and should lead towards audio standards, easier content exchange between planetariums, and affordable solutions.

The committee will cooperate with Ian's committee, communicate with vendors, and support existing and new planetariums with advice to achieve optimum sound, allowing the audience a natural and fully immersive experience.

Spending most of our budgets and production efforts on visuals, most of us still seem to underestimate the role of sound and acoustics in our domes. But just think about it: the whole illusion of an infinite sky filled with a perfect star field will be immediately destroyed if the sound field reveals to our ears that we are still sitting in a small chamber just a few meters in diameter. That is why I felt it is time that IPS provides assistance here, and Rene will be a good mover and shaker for this and spearhead this new task for IPS.

I am sure we will be able and really need  
(Continues on page 8)



# One Dome

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Maciej Ligowski  
Monika Malinowska  
Copernicus Science Centre  
Warsaw, Poland



Copernicus Science Centre

## Preparing for IPS 2016

“Have you ever dreamed of flying...?” says an enticing voice, as all around us we behold a beautiful blue sky punctuated with white clouds. This is the impressive beginning of the film *Dream to Fly*, the first original production created by the Heavens of Copernicus Planetarium, which has already won a number of awards (including a Janus Award at the Jena FullDome Festival).

Here at the Copernicus Science Centre, we have dreamed of flying. As a result, a lot has changed for us during this past year since we were selected to host the IPS 2016 conference. Aside from releasing our own film, we have also started organizing concerts, where audiences can enjoy classical music and jazz while gazing up at the stars. Such images and sounds, created live, have helped many visitors discover that a planetarium can be an exciting place for everyone, not only for astronomy fans.

We have also begun collaborating with the European Space Agency (ESA) with its educational program called ESERO, the European Space Education Resource Office, that taps into primary and junior high school students' natural fascination with space, raising their awareness of the broad range of professional opportunities in the field.

## Facing the challenge

As you can see, we are always seeking new challenges, and hosting IPS 2016 will indeed be a big challenge. We want to thank the many people who placed their trust in us! We will do our utmost to make good on that trust, to host a truly memorable event. Although the whole of IPS is now focused on the upcoming conference in Beijing, we have already started working on the one to follow.

Our conference theme will be “Revolve,” which is intimately related to the name of Nicolaus Copernicus, the man who stopped

the sun and set the planets moving.

But please do not think that we chose this slogan just because Copernicus was a Pole and his name figures in the name of our planetarium. In fact, the choice reflects much more: boldness of thought, a bold perception of the world around us, an ability to look at the world from a different perspective.

This is the idea we want to bring to life by organizing the conference in Warsaw, and that is why, together with the IPS Officers, we are striving to reinvigorate the way the conference is approached. We perceive it not as a one-off event, but as a coherent cycle that addresses issues important for the whole community of planetarians.

Warsaw's being chosen to host IPS 2016 coincided with the establishment of the Vision 2020 group, whose objective is to develop a strategy for IPS in the coming decade. As part of its efforts, teams will be set up to explore topics important for the organization's future.

Together with Paul Knappenberger, the future president of IPS, we decided that those issues would be the key topics around which we wanted to build the program for IPS 2016. As a result, the conference will offer an opportunity not only to take a look at the latest technological advances and to network with colleagues, but also to engage in very substantive discussions.

## Focus: Under the dome

We intend to devote a lot of attention to working under the dome. We will show you interesting commercial presentations involving new technologies, as well as typical planetarium productions (both full-dome animations and live shows). We would like all these demonstrations to serve as inspiration, provoking the exchanging of experiences and ideas for the future.

Overall, our dream is to initiate a kind of

momentum that will ensure IPS's dynamic development, bringing tangible benefits to the whole community.

We have already launched the website ([www.ips2016.org](http://www.ips2016.org)), now offering basic information about the conference. As time progresses, we will be further developing that information and expanding the website. Adopting a new approach to the conference also means trying out a more interactive way of organizing the event itself.

Your voice is very important to us, and so we have posted a few questions on the website, asking about what you would like to discuss during IPS 2016. The results of that survey will help us better recognize your expectations and, ultimately, to organize a truly great conference! We look forward to seeing you in Warsaw in 2016. ☆

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*(President, continued from page 6)*

to reach out with these tasks to other groups with considerable expertise, such as IMERSA, the Giant Screen Theater Association, and the International Laser Display Association. After attending the recent and truly impressive IMERSA summit in Denver, I am even more convinced that we have to work together and benefit from all the expertise which is already there in our worldwide community of immersive theaters.

Future joint projects and memos of understanding with organizations like those mentioned above and also ECSITE and ASTC and scientific partners like NASA, ESA, ESO, JAXA, et al. are already on the drawing board within our Vision 2020 strategy. I will inform you in the next issue of our journal about results and conclusions from the first IPS Vision 2020 workshops we scheduled during IPS 2014 in Beijing, gearing towards a better planetarium society we all want to build together. ☆

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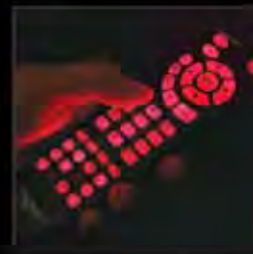
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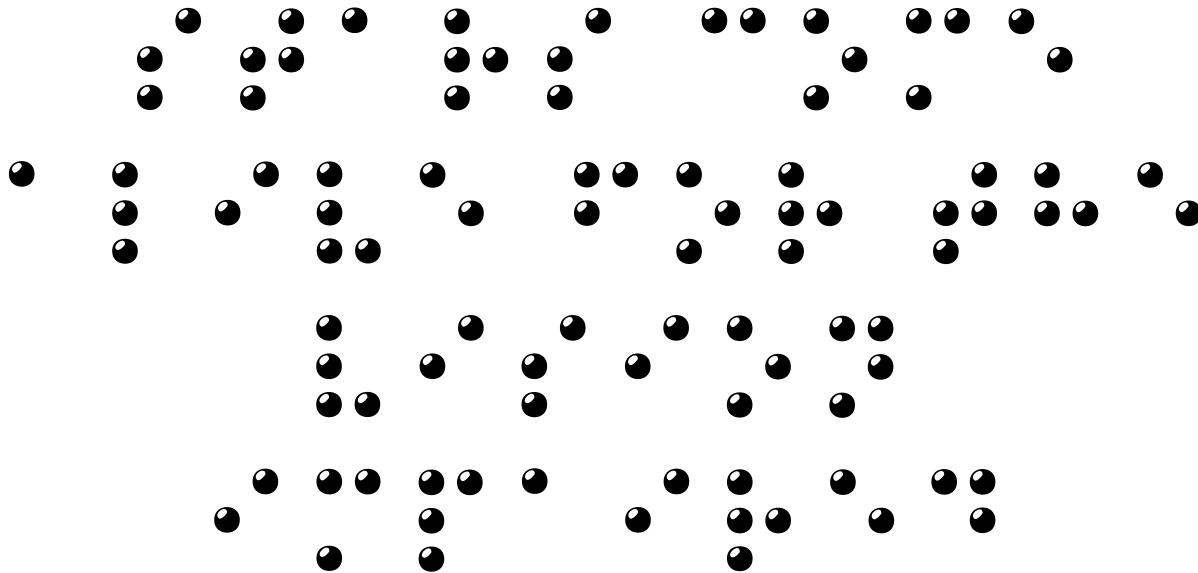
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(Stars come alive for the vision impaired)



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Imagine walking into a planetarium and hearing the audience gasp in awe—yet there is nothing but darkness all around. There's a narrator talking about stars "over here" and a wispy galaxy "back here" found by "following these stars," but you have no idea where "here and there" are and you certainly are unable to follow "these" or any stars. To you, you are just in a dark room. But then, aren't you always in a dark room?

This is how visitors who are blind or have low vision experience a planetarium. Perhaps there might be a speck of light or two, the brightest stars and planets visible in the sky, but overall it is just a large dark room with a narrator describing where to find things they cannot see. It is a frustrating and potentially boring experience that is most likely going to leave visitors who are blind discouraged and disappointed with astronomy and space science.

With the Missouri School for the Blind, Delta Gamma Center for Children with Visual Impairments, Lighthouse for the Blind-Saint Louis (LHB), and many other schools and groups that support potential visitors who are blind located in the same city, the James S. McDonnell Planetarium at the Saint Louis Science Center (SLSC) has realized the need to be able to provide a more engaging and inclusive environment so that visitors with this exceptionality can enjoy a more fully engaging experience in the planetarium.

With the help of the aforementioned institutions, particularly LHB, the McDonnell Planetarium has embarked on the journey of accessible for an audience it was previously unable to reach.

### A project and a proposal

The project started in the fall of 2011, as a project for my master of arts in Museum Stud-

ies program from The Johns Hopkins University. The goal was to create a proposal for a new program or current program we wished to adapt. Upon looking around my planetarium, I noticed that we had ways to make our shows accessible for almost all of our visitors, no matter their abilities, except those who were blind or had low vision.

I knew I needed to focus at first on one show to kick start the program, which could lead to the adaptation of all our other planetarium shows. *The Little Star That Could* was the obvious choice to me for several reasons:

- It has strong basic astronomy content that, even though intended for an early childhood audience, can be enjoyed by all ages (opening the planetarium to pre-kindergarten through third grade visitors who are vision impaired, and those who might accompany them);
- It is shown in planetariums worldwide (which means that we can hopefully help other planetariums showing *Little Star* become more accessible as well);
- It has been in planetariums since it debuted 1986, which shows that it has held its appeal for almost 30 years (and thanks to Audio-Visual Imagineering's astronomical and full dome updates in 2008, should continue to hold its appeal and relevancy for years to come);



The cast of star characters, from left: Big Daddy, Little Star/Sol, Pearl, Mr. Old-Timer, and Mr. Angry Blue-White Star.

## Relating warmth and texture to colors

Big Daddy is made from a red, smooth, satin-like material to provide a cool, slick feel (and is left at room temperature). The planetarium educator explains that since Big Daddy is red in color, he is the coolest of the stars.

Next is Mr. Angry Blue-White Star, made from denim to provide students with a rough, warm feeling and heated to be the warmest. Visitors are asked how Mr. Angry Blue-White Star feels in comparison to Big Daddy and the planetarium educator explains that he is the hottest of the stars since he is blue-white in color.

Then, Little Star, made from a soft,

quilted average cotton style material (heated to the median temperature of the stars), is handed to the visitors. Little Star is yellow and much smaller than the other two previously mentioned stars, and is average in temperature.

He is followed by Mr. Old-Timer Orange Star made from a canvas material (heated to fall between Big Daddy and Little Star), and finally Pearl (heated to fit between Little Star and Mr. Angry Blue-White Star), a very large white star who is made from velvet (for a softer but warmer feel), to show the differences of all the different star colors.

- *Little Star* meets Next Generation Science Standards for grades K-5, so teachers can use the show as a relevant addition to a science unit, and finally;
- It holds an influential place in my own heart because it was originally written and produced by Laura Kyro and the SLSC in 1986, and was the first planetarium show I saw as a child. Furthermore, I now see it have the same effect it has on others as it had on me, as many of our visitors come back time and again for *Little Star*, once again showing its ability to captivate audiences.

The program I subsequently created and proposed, *Feeling the Stars*, was also proposed to John Lakey, director of the McDonnell Planetarium, as well as the SLSC, once the course was complete. The proposal was accepted and a small group was formed to tighten the plan before making the ask for a grant.

We received crucial insight from Stephen Kissel, a representative from LHB who is also totally blind, and Debra Busch, a volunteer at SLSC, who has low vision. The two of them were key to helping me determine what worked well and what did not, and they (along with LHB) also helped me make connections in the community so that I could

test prototypes with children who are vision impaired. By August of 2012, we were graciously awarded a grant from LHB to produce the program in-house at SLSC.

### Program application

The *Little Star That Could* program is a basic educational planetarium program, which is described as follows: "The story of an "average" star who travels the universe in search of planets. Along the way he makes many discoveries about stars, planets, galaxies and himself. This show is recommended for early childhood age, but is a great show for the whole family."

Generally, in the McDonnell Planetarium, this show is projected using high definition media projectors and runs in tandem with the Zeiss Universarium Mark IX star projector. The *Feeling the Stars* program for *The Little Star That Could* consists of the following components that adapt the conventional experience for visitors who are vision impaired:

### Zeiss projector and how it works

It is helpful to familiarize vision-impaired visitors with the environment they are about to enter. Even if they cannot see the planetarium and its projector, they can tell there are differences in air pressure and the way sound moves, and they can hear the star projector moving as well.

One of the easiest ways

to familiarize visitors with the star projector is through touch. Since it is too dangerous for visitors to climb on the projector to touch it and hazardous for the projector itself, I rendered a design for a tactile model of the star projector and the Orthwein StarBay (the planetarium's theater that houses the 80-ft dome and star projector) in 1:40 scale in a computer assisted design program.

The model, its casework and the production of the exhibit text were fabricated in-house thanks to the SLSC Exhibit Production Department, particularly Preparator Ian Smith. The model, while used with the program, has become a permanent exhibit in the planetarium lobby, and is available to all visitors to safely explore through touch.

The model is made of the same or very similar materials as the actual Zeiss and StarBay, and a planetarium educator can provide an oral description of the model to supplement the exhibit text if desired. Visitors learn how the opto-mechanical projector produces stars and other celestial bodies, and can touch the dome of the model to find tactile stars made of various sized rivets that form the autumn and winter constellations of the Northern Hemisphere.

The signage on the model, in both large print and braille, describes how the projector works, while small tactiles around the rest of the casework's top allow visitors to feel what the perforated aluminum of the dome feels like and how to discover the shape of a constellation, like Orion, through touch.

Our volunteer, Debra Busch, was crucial in translating the exhibit text I wrote into braille and checking the large print version for readability. The braille was then cast into a permanent sign by Ian Smith, while the large print text was arranged to be back printed on non-glare Plexiglas through Denis Smith in the



An early elementary school-aged visitor examines the differences between the different Little Star plush characters.



Left: The inside of the tactile model of the Orthwein StarBay and Zeiss Universarium Mark IX star projector. Below: An early elementary school-aged visitor and his pre-school-aged sister enjoy exploring the star bay model.



SLSC Graphics Department.

This introductory experience is not only important for visitors who are blind, but also for visitors who have an Autism Spectrum Disorder (ASD), as it can provide a sense of comfort in a new situation that might be frightening otherwise.

### A tactile experience

*The Little Star That Could* program relies heavily on colors, which students who are vision impaired may not have seen before, so it might be difficult for them to understand some of the important concepts in the program. The format for the program raised the question of how to describe the colors of the stars, the shapes of the constellations, etc. to these visitors. Filling in missing background knowledge, such as colors and how they relate to stars, is best addressed before *The Little Star That Could* to prepare the visitors' schemas.

The activity requires plush characters from the show. I designed patterns and sewed prototypes which were adjusted based on feedback from vision-impaired children before I sewed the final products. The characters are made to scale with each other and stuffed with microwaveable materials (such as rice) to enable the different stars to be heated to different temperatures.

They are also made of different heavy-duty materials and upholstery fabric to help associate texture to the temperature and color, and visitors are able to feel the facial features of each character.

More often than not, visitors have heard some explanation of colors before, but it may contradict what they learn in the show, and for some, the idea of colors may not have significance. If they refer to colors and temperatures, they might be regurgitating what they've heard others say (i.e. "Don't touch that pan, it's still red-hot!") without a real connection to the concept.

A more tangible and concrete example builds a meaningful connection to the idea of colors, especially in relation to this show and real stars in the universe.

The planetarium educator starts introducing the stars characters by addressing the idea of average. Using the example of the three bowls of porridge from *Goldilocks and the Three Bears*, the planetarium educator asks the kids to describe the three bowls (too cold, too hot and "just right").

Then the educator asks the visitors, "How could Goldilocks have made the too hot bowl or the too cold bowl "just right?" The visitors respond by mixing the two, and the planetarium educator then says "that is an example of average; mixing the two extreme temperatures creates the average temperature." Through this, the visitors can think of average stars as being in the middle of hot and cold stars.

The planetarium educator then introduces the star figures that have been previously heated in a microwave to their proper temperatures (or to a temperature hotter than what would be used immediately so that the stars retain their heat if there will be a delay in the visitors using them).

Once the introduction to characters is complete, each young visitor who is blind is handed a special book to use during the show. These books feature raised images of Little Star meeting each character, and the constel-

lations to which each star relates, on Brailon® paper (a plastic-like paper that can be molded with heat to create durable pages of braille and tactile images).

Once again our volunteer, Mrs. Busch, was extremely important as she translated the text that describes what is occurring on each page of the book into braille, as well as checking the final product for mistakes and accuracy.

I produced the tactile images from the show from hand-crafted molds that match the braille Ms. Busch produced, using a Brailon Duplicator (a machine that copies raised images and braille into a sheet of Brailon by heating the page and forming it around the mold using a vacuum).

The pages with the raised images from the show have been bound into a twin-vision book so the Brailon page with the raised images and braille is on the left side of the book, while a laminated page with color images and large print text of what is on the Brailon page is on the right. Furthermore, the images on the right side of the book are simplified, removing much of the ancillary background so that only the characters show, helping visitors with low vision focus in on who is important to the story at that point.

The books are more versatile in the twin-vision format, allowing a visitor with low vision or a sighted guide to follow along in the book as well. The books allow vision-impaired

Right: The twin vision pages of the tactile follow-along book at the point where Little Star meets Mr. Old-Timer Orange Star in large print on the left and tactile images and contracted braille on the right. Below: The children explore the tactile-follow along books.



visitors as well as anyone who is watching the show with them to experience what was going on in the show with their fingers and/or eyes while they listen to the soundtrack.

A small flashlight with a red filter is available for sighted guides assisting the vision impaired using the book.

Students with low vision can either follow along in the books or, depending on the severity of their exceptionality, supplement their experience with the projected video and stars using an iPad that can be held close to their eyes.

The same show that is projected onto the planetarium's dome can also be viewed on the iPads through an application used for long distance meetings such as TeamViewer. This application allows the same video that is running on the main computer to be streamed on the iPads so that the same video is seen by all visitors.

Since the students will have already felt the faces of the characters once through the heated plush figures, they have some familiarity with them. The book and/or iPad help to reinforce their prior knowledge and perhaps gain a better understanding of the plot by having a tactile image, or an image that is easier to see, to go with the planetarium show.

### Reception and findings

The *Feeling the Stars* program for *The Little Star That Could* premiered to its first audience

on 14 June 2013. In the year since then, more than 150 visitors have experienced the program. The general feedback has been very positive and there have been repeat visits.

### Tactile Planetarium Model:

The visitors (of the tactile program and the general public) enjoy the interactive model, finding it helpful in knowing the space of the planetarium's StarBay and what the projector does. Furthermore, those who read braille found the exhibit text useful and were thrilled to be able to explore the exhibit on their own. Those who read the large print said it was easy to read.

A 4-year-old male visitor who was totally blind seemed particularly delighted by the braille, even though he was not yet reading it by himself. He exclaimed to his nanny, "There is braille on here for me!" She proceeded to help him recognize the braille by running his fingers over the lines while she read the printed text aloud to him.

Visitors from the general public also take great interest in the model as they can touch everything, and they can try their hand at reading braille as well.

### Plush Star Characters:

The plush star character tactiles are also well received, with many children deliberately exploring the characters' facial features and shapes as they were passed around the group.

It was mentioned that the different fabric textures were helpful and made the experience more pleasant as well for some of the children.

Furthermore, the size differences also helped the children differentiate between the different characters. Some children who were not comfortable with the idea of touching other tactiles in the program (due to tactile aversions) found the plush characters comforting and enjoyed meeting the characters in this manner.

In one case, an older elementary school male child who does not normally like touching objects due to his tactile aversions formed a very special bond with the Little Star plush, telling it goodbye, giving it a hug, and handing it back to me with a sad expression on his face at the end of the program.

While overall the characters were helpful, it should be mentioned again that some children may have tactile aversions to stuffed animals as well as other materials. While the material was carefully chosen to prevent sensory discomfort as much as possible, sometimes children may not want to try feeling the characters or any of the other tactiles used in the program. While this reaction may not be entirely preventable, the presenter needs to be aware that this could happen and that the child should not be pushed if she or he feels uncomfortable touching the plush characters.

### Tactile Books and iPads:

Children and adults who are totally blind, or who have low vision but prefer the book to the iPad, have all used the tactile follow-along books during *The Little Star That Could*. These visitors explored the books both before and during the show and the general feedback was that they were extremely helpful for the users, and that the children very much enjoyed touching them.

Adult users also appreciate the braille descriptors on the pages with the tactile images as they could follow along in the book easily

*(Continues on page 14)*

# A "first" for India

## Nehru Planetarium launches special show for hearing impaired

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Nehru Planetarium of Nehru Centre, Mumbai, along with Infovision Technologies, India launched a special planetarium show on the occasion of its 37th anniversary on 3 March 2014, for people with hearing disabilities. It was the first of its kind in India.

*Wonders of the Universe* by Evans & Sutherland has been converted for the hearing impaired by Infovision in association with the planetarium and Vedarth Animations, Mumbai. The project is supported by Astral Inc., a production house of full-dome video and large format shows for planetariums and digital dome theatres based in the United States, with an office in Mumbai.

The planetarium program was formally launched by Mrs. Bakul Patel, Joint Secretary of Nehru Centre, Mumbai. In her address she said "it gives me immense pleasure to know that the planetarium has kept its promise to reach out to differently-abled people" and added that their contribution play a crucial role in India as well.

She quoted Pandit Jawaharlal Nehru, who in his book *Glimpses of the World History* wrote "We know that our earth which seems so big to us, is but minor planet of the sun, which is itself very insignificant little star. The whole solar system is but a drop in the ocean of space."

The program started with a welcome note by Shri Arvind Paranjpye, director of Nehru Planetarium. He said that Nehru Centre, under which the Nehru Planetarium functions, is known for its commitment for social causes, be it in arts or sciences, and the special program is another step taken to reach out to people who can see but cannot hear.

The uniqueness of the programme is that Indian Sign Language is common to all Indians and therefore any person knowledgeable in language can enjoy the show irrespective of his or her mother tongue, he added.

Mr. Paranjpye and Abhijit Shetye, managing director of Infovision Technologies, the leading producers of digital adjustment, are the force behind the initiative.

In his address Mr. Shetye said that "A special technique of digital superimposition was used for producing this show." Ms Kinjal Shah, who is an expert Indian Sign Language interpreter, guided Mr. Sunil Sahasrabudde, Indian Sign



Left: The audience responds to the program; Right: Mrs. Bakul Patel, Joint Secretary of Nehru Centre. Photos provided by Nehru Planetarium.

Language person, in preparing the planetarium programme. Shri Shetye also said that "We have plans for using Infovision Mobile Digital Planetarium platform to reach the special show across interiors of India."

Shri Shetye shared that the project received

a valuable guidance from Mr. Rangasaai, former director of Ali Yavar Jang Institute for Hearing Handicapped of Mumbai.

The program was attended by more than 250 hearing impaired people, most of them school children. ☆

(*Vision impaired, continued from page 13*)  
on their own.

It should also be noted that tactile component of the book was helpful for some children who have a ASD as well. One child in particular has experienced the program twice, and while normally he stays silent due to having an ASD, he responded very positively to the book and enjoyed reading it aloud to anyone willing to listen.

The iPads have not always been used during *The Little Star That Could*, as it has been found that many visitors with low vision are able to see the show as projected on the dome since the projection is large enough. Those who have needed and used iPads were vocal that they enjoyed being able to see the show easily through the use of the technology. It was mentioned that the iPads worked well for all ages (though sometimes assistance is needed from an adult for the younger visitors), and for varying levels of visual ability.

It is also important to have a stand available for visitor who may not be able to hold the device on their own. Stands made specifically for the tablet work well, as do portable music stands.

The iPads can have small issues from time to time, as might be expected with technology. It was discovered that the internet bandwidth is not always sufficient for streaming the video to all the iPads and the video ap-

pears to jump and jerk on their screens. Another problem is that occasionally the user may accidentally exit out of the TeamViewer app, which requires assistance to restart. Until a way to lock the screen in the TeamViewer app is available, planetarium educators monitoring the program need to be vigilant of helping visitors if this issue occurs.

### Conclusion

By offering the revised version of *The Little Star That Could*, the James S. McDonnell Planetarium has become accessible to a whole new population of visitors. Revisions based on visitor suggestion and staff observations have helped improve the program and further the benefit to the target audience of early childhood students, their families and teachers who are blind or have low vision.

All visitors should have the ability to step into the planetarium and have access to the programs and activities offered there. By taking steps toward facilitating the accessibility of its programs for all visitors, the James S. McDonnell Planetarium and Saint Louis Science Center have begun embracing universal design; welcoming an underserved part of the population of Saint Louis, Missouri; and, hopefully, paving the way for other cultural institutions, especially planetariums, to follow suit. ☆



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## How Big Bird became a fulldome superstar

The making of *One World, One Sky*



By Mark Paternostro  
Evansville, Illinois

Mark Paternostro is an artist and creative director of future feedback network. He is a veteran of 30 years of making planetarium shows. A former director and producer with Adler Planetarium in Chicago, Illinois, he has more than 35 sky show and exhibition credits in his portfolio, with *TimeSpace* and *The Searcher* are classic examples of his work. He was an original member of the *One World, One Sky* production team. He can be reached at [atomthought@gmail.com](mailto:atomthought@gmail.com) or [paternostro.art@gmail.com](mailto:paternostro.art@gmail.com).

Who knew? Who would have thought the lovable, yellow-feathered giant, Big Bird, along with his happy-go-lucky pal Elmo and their friends, would find a world of discovery and wonder inside a planetarium dome? And, while under that dome, they would visit friends in China and friends would visit them in America? Who knew that the Muppet troupe would fly to the moon, and, best of all, learn that we all live in one world, under one sky? As it turns out, there was one person who did know, and his name was Joel Schneider. What follows is the untold story of *One World, One Sky*.

## An idea germinates

Idea seeds can sometimes be planted in unlikely places, and that appears to be the case here, as we trace the beginning of our story back to the early 1960s. At the time, Joel Schneider was a math major attending Franklin and Marshall College in eastern Pennsylvania. It was here that he met and became close friends with Paul Knappenberger, another math major, classmate, and future fraternity brother.

After graduating, Joel went on to pursue a career as a math teacher, eventually specializing in mathematics education. In 1983 he landed a position at Sesame Workshop as a project director in the software division.

Joel's career blossomed at the Workshop as senior mathematician and content director for *Square One TV*, a kids math show series, along with "Math Talk" and "Risky Numbers." Joel would later become the Sesame Workshop vice president for Education and Research. It was during this period that he began to look east, toward China.

## A different career path

Paul decided to pursue a different career path, turning to the study of astronomy in graduate school. He first found a professional home at the Science Museum of Virginia, in Richmond, Virginia, creating a world-class science learning institution and leading-edge digital planetarium, the first of its kind.

In 1991, Paul brought his talent and vision to Chicago with his appointment as president of the Adler Planetarium and Astronomy Museum.

In 2000, after seeing each other at their college reunion a few years earlier, Joel called Paul and said there was a collaborative project he wanted to develop.

"I'm thinking it would be great to produce a planetarium show for young children using the Sesame Street characters," Joel told Paul. He had already approached the Hayden Planetarium, which was based in New York, but received a lukewarm response. The conversation continued as Joel filled in more of the details. By the end of the call Paul said, "It sounds like a great idea and we'd love to work with you."

That is how two math majors began a creative partnership between the Sesame Workshop and the Adler Planetarium.

## 2000: On with the show

The central idea was to use the sky as a way of introducing young children to science and math. At the same time, the Sesame Workshop was keen on reaching a bigger audience in other countries around the world. To that end, Joel was interested in producing a Chinese and American version of the show, to build a cultural bridge for American and Chi-



The Planning Teams in Beijing. On top is the 2002 Team, with Joel Schneider in the back row, second from right Photo by Craig Stillwell. Below is the 2007 Team, with Jin Zhu, who became the Beijing Planetarium director in the interim. Photos provided by author.

Right: Two languages and one sky: the program's promotional poster. This image and the full-dome frame on the facing page are © 2008 Adler Planetarium/Sesame Workshop; used with permission.



nese children using the sky. Beijing, Chicago and New York are all the same approximate latitude and share a common night sky. That, as it turned out, was the binding link for *One World, One Sky*.

Following an initial meeting in Chicago, Joel and Paul decided that creating such a unique show was a project definitely worth pursuing. They agreed that the Sesame Workshop was very good at producing children's shows, and Joel would pitch the merits of the idea to Hyman Field at the National Science Foundation.

There was strong interest in the project at the NSF, and Hyman encouraged Joel to make

contacts in China to explore the possibility of becoming partners in the effort.

Around this time, Paul also established a strong connection with Madame Shizhu Cui, who was then director of the Beijing Planetarium, and formed a sister planetarium relationship to work together and exchange ideas, information and shared interests.

Joel moved quickly to arrange a planning meeting with the Beijing Planetarium director, staff and funding representatives (China's equivalent to the NSF). He made the trip to Beijing in 2002, accompanied by Adler astronomer Larry Ciupik. As a result of the positive feedback garnered during the Beijing meet-

ings, a show outline and treatment were created, and with that, a formal proposal was written and submitted to the National Science Foundation.

After the customary review process, the NSF agreed to fund a portion of the project with the caveat that private matching funds were required. And so began the challenge to attract private sector sponsorship from corporations, foundations and individuals inspired by the idea.

The effort was off to a promising start with funding pledge support from numerous business leaders in Chicago and New York.

## 2001: Funding hiatus

The unforeseen events of 9/11 brought much of the funding efforts to a standstill. Enthusiasm and logistical support was offered, but the uncertain economy tempered funding decisions. Undeterred, the show's planning meetings, activities and international communication continued in New York, Beijing and Chicago, as the story slowly developed.

In 2003, the project languished, but eventually the Children's Television Workshop raised sufficient private funding (not quite the full NSF match) to move forward. Joel approached the NSF again, and offered ways to reduce costs and reach out to the Beijing Planetarium to expand their role in the production.

His efforts were successful and the National Science Foundation gave the project a green light.

Joel and Paul met on several occasions with Madame Cui to work through an official agreement and set the stage for production to begin. In yet another turn of events during the funding hiatus, Dr. Jin Zhu was named to succeed Madame Cui as Beijing Planetarium director. He was equally enthusiastic about making the show a reality.

## 2004-2006: A sad turn

Sadly, in September 2004, Joel Schneider passed away. For the remainder of 2004 and through late 2006, the project laid dormant. All of the key people had moved on to oth-

er assignments and the project faded into the background.

To everyone's surprise, in early 2007 the production had suddenly come back to life. A few leaders at Sesame Workshop and Paul Knappenberger were the main impetus behind the project's resurrection, and things moved quickly from that point on. Script development and storyboards soon followed as the pace picked up.

It's not widely known, but originally the show was going to be produced as a slide show that could play in standard planetariums using an analog star ball and special effects slide projectors. It was thought the show would reach a larger audience in that format than in the emerging digital and video theaters.

However, during the slow start-up period, dome projection technology raced forward, developing into the many forms known today. By the time production finally got underway, it was clear that full-out computer graphics and high definition video was the way to go.

In April 2007, the Adler team traveled to China for the first major production summit, hosted by Dr. Zhu at the Beijing Planetarium. The meeting was a milestone event. All hands were on deck, as the actual show making process finally gained traction.

Communication channels were established, technical specifications compared, and the Chicago team toured the remarkable group of dome and theater spaces within the Beijing Planetarium complex.

A few months later, the Adler Planetarium reciprocated, hosting the Beijing team in Chicago. Project momentum increased as the production pipeline was worked out in detail.

"In a production sense, *One World, One Sky* can also be seen as two worlds, one sky. That was the fascinating part of the production," Paul explained.

"Hu Hu Zhu lived on Sesame Street in Beijing, while Big Bird, Elmo and his friends lived on Sesame Street in New York. It made practical sense for each creative team to model their local Sesame Street set. Other scene elements were shared and combined to make the streets real."

## 2007: New York, Muppets and principal photography (oh my)

At last, in early September 2007, the story characters came to life when Big Bird, Elmo, Hu Hu Zhu and friends stepped on to a huge green screen sound stage in New York to shoot principal photography. Guided by Sesame Producer Christina Del Fico and Director Ken Diego, the shoot wrapped up within a week.

For the remainder of the year and well into the next, the Beijing and Chicago creative teams were fully engaged in completing their respective 3D set models, in addition to extensive motion and color testing in the dome.

One particularly painstaking task was masking muppet fur and feathers from the green screen background, which was not as easily keyed out as it was for TV.

The transition of the characters from television to the dome environment was carefully thought out. Eye levels were tested, as well as character size on screen so as not to frighten the young audience. Hard drives made regular flights from city to city.

In the spring of 2008, compositing of the two location destinations had begun. The characters spoke Mandarin on Sesame Street East and English on Sesame Street West.

By July, most of the final 450,000 frames had been assembled and cut into a trailer that previewed at the IPS meeting in Chicago that summer. A month later, it was ready to show to the world. It's still playing, planet wide. It's funny, it's wonderful, it's imagining a trip to the moon with Big Bird and friends. It's *One World, One Sky*.

## 2014: Epilog

The universe has made at least one life-bearing world out in the cold dark realm of the stars. It's our home, Earth.

In 2004, Joel Schneider left it, succumbing to cancer at age 61. He never saw *One World, One Sky*, but he would surely be proud of his creation. It is the most widely distributed planetarium show of all time.

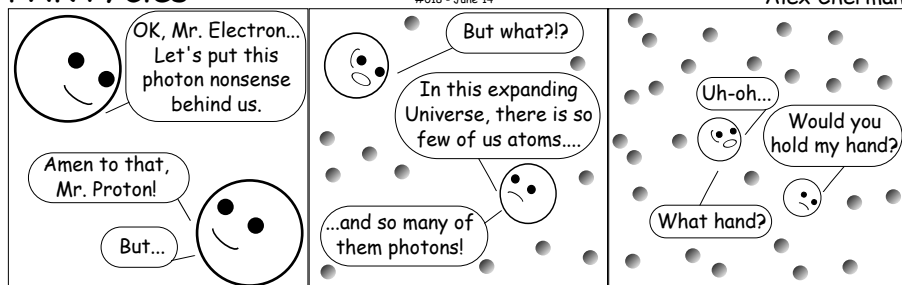
To his friend, Paul, he had said, "This is a show for the ages. In theory, it could run forever, and every year there will be more children who can see it."

Spoken like a true mathematician! ☆

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The follow-up evaluation report about *One World, One Sky* can be found at [informal.science.org/images/evaluation/Final\\_US-China\\_impact\\_research\\_report\\_Final\\_10-28-11.pdf](http://informal.science.org/images/evaluation/Final_US-China_impact_research_report_Final_10-28-11.pdf)

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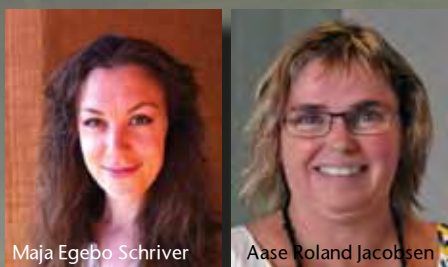
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*How seaweeds got to cover the dome in Denmark*

## Audio-visual project turns the view

*upside down*



**Maja Egebo Schriver, Artist  
and  
Aase Roland Jacobsen, Planetarium Curator  
The Steno Museum  
University of Aarhus, Denmark  
aase.jacobsen@si.au.dk**

*Plants of the Ocean* was an audio-visual installation designed by Maja Egebo Schriver for the Planetarium at the Steno Museum in Aarhus, Denmark. She designed the visual set-up and composed sound and music for the installation, and the programming of the show was done by Ole J. Knudsen and Aase Roland Jacobsen (The Steno Museum).

The audio-visual elements were designed to interact with the unique setup of the planetarium dome and seek to position the ocean as an aesthetic soundscape surrounding and

immersing the audience. The installation exemplifies an alternative use of the planetarium and demonstrates how modern art can incorporate spatial attributes in order to support an increased synergetic relation between the room and the media projected within it.

We often experience that people become fascinated when they enter the dome—simply by the shape and atmosphere of the room. That was exactly what happened in autumn 2011 when a book about sea plants was published by Aarhus University Press. The Steno

Museum is part of the Aarhus University and is often used for special events, so the book was presented at a mini-symposium held in the planetarium.

The book's editor, Peter Bondo Christensen, got the idea of making a planetarium show that would take the audience to this underwater world of Danish sea plants, combining underwater video, photos and music into an artistic audio-visual installation in the dome.

The overall idea was to transform the dome into an underwater world, which would give audiences a view into the hidden world at the bottom of the sea and thereby impart knowledge about the oceanic environmental conditions, which—due to climate changes—are

Composer and installation artist Maja Egebo Schriver received a master's degree in musicology from Aarhus University, Denmark, and a master's in composing for moving images from City University, London, United Kingdom. Find out more about her work at [www.majaebos.com](http://www.majaebos.com).

Background: Fulldome slide portraying an eelgrass meadow, photo: Maja Egebo Schriver. This page, top: the planetarium with light diodes on the floor, so the audience can find their seats. Photo by Jens Riggelsen. Below: photo of sea plants in dome view. Photo taken by Peter Bondo Christensen and developed in DigiDome from Sky-Skan by Ole J. Knudsen.



challenging the ecosystem that the sea plants are part of.

The visual material, consisting of video and slide projections, was filmed in the Danish waters around the island of Funen by Peter Bondo Christensen and Søren Larsen, who are both biologists and professional divers.

### The possibilities of audio

The planetarium is a soundproof space and thus offers a limitless amount of audio design options. However, as part of the physical set-up of this installation, the inner and outer entrance doors needed to be kept open during the show since we wanted people to be able to come and go during the 60 minutes of the program.

To solve this situation, the entrance was covered by curtains with sea plants, which allowed a limited amount of ambient sound and light to enter the room. Accordingly, the sound from the installation filtered out, which titillated the attention of the museum guests, drawing them into the room.

The audiences had to pull aside the fringed curtains, as though they were finding their way through an eelgrass meadow in order to enter the hidden underwater world. From inside the dome, the inner curtain was kept slightly fluttering from a draught, like sea plants waving in an underwater stream.

Unlike most planetarium shows, the installation functioned as an open room where audiences could walk in and out and explore the underwater world on their own. Therefore, it was also necessary to mount small chains of dim blue light diodes underneath each row of chairs, guiding the audience to explore the room.

### Sound as a primary element

Within a cinema, sound is often perceived as a secondary element designed to support the visual narrative, but the concept of this planetarium installation was to balance the three elements of visuals, audio, and space as equal components.

The installation explored how the atmospheric identity of each visual scene could translate into a musical expression, and the installation could be seen as a journey through different abstract, as well as physical, spaces

within the ocean. Through a mixture of electronics and recorded sounds, the audio sought to explore the border between music and sound by implementing sound design based on field recordings from the ocean into a musical composition, and this compositional strategy fostered a rather abstract and intriguing musical universe.

The installation is set up in surround sound format (5.1) to fully take advantage of the circular planetarium. Working with surround sound gave the composer the freedom to position a sound source or movement anywhere in the sound field, and it thereby emphasize the dynamic and fluid identity of a sonic underwater universe.

The surround format emanates from cinema, and it is designed to increase the feeling of immersion into the film. In cinema, the speaker positioning has an increased focus towards the front, where the screen is placed, but in this installation, the aim was to dissolve the feeling of front and back, and instead increase the circular and immersive feeling that the planetarium when all speakers are used equally.

Although the chairs are facing the front of the room, the nature of the visual projections and the dynamic sonic unfoldment encour-

aged the audience to explore the planetarium from various positions.

### Water as compositional structure

By means of thematic cohesion, the water molecule was used as a significant compositional structuring principle in the installation at a micro as well as macro level. The molecule's tripartition (H-O-H) between the atoms hydrogen and oxygen (see figure 2), and the six- (and twelve-) angled net the water molecules form when they bind with each other (see figure 3) underlies the structure of the composition at several different levels.

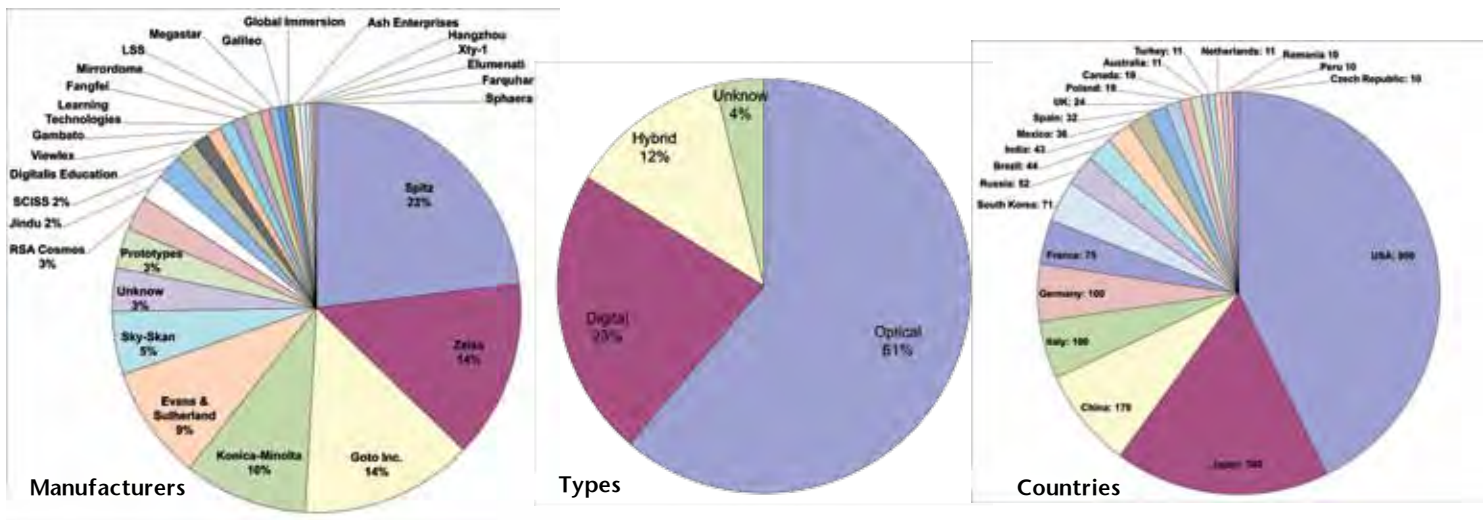
First of all, the six-angled structure is transferred to the positioning of the speakers within the dome (the surround format). Thus, the audiences are surrounded by a (sound-)net in accordance with the molecular structure of the ocean.

The six-angled net is also apparent in the overall narrative form, and further through the fact that the performance of this circular movement and structure could be repeated indefinitely. This finds symbolic union in the indefinite extent of the ocean.

Moreover, the molecular tripartition functions as a motif consisting of three notes, which are composed and modulated in var-

*(Continues on page 22)*





## WPD, at 10 years old, continues to mature

Daniel Audeon  
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The Worldwide Planetariums Database, an inventory of all fixed planetariums in the world, continues to evolve and make permanent upgrades since it first debuted in 2003.

The WPD is a searchable database. Each planetarium has its own page with several photos and accurate location information. Although it was just a list of French planetariums at the beginning, it quickly became a worldwide list and is hosted on the website of the Association of French-Speaking Planetariums (APLF).

Every two years, the IPS publishes a global directory in pdf format, freely accessible from the IPS website ([www.ips-planetarium.org/?page=dir](http://www.ips-planetarium.org/?page=dir)). WPD is an adjunct source, also freely available online, that can be upgraded at any time. Simply send an email with new information, corrections, adding pictures etc., to the email at the bottom of each page.

A major effort has been made to find as many planetariums as possible. English seems to be a common language for all. To facilitate research, nothing beats a visual, so, in your search for a planetarium, you can only use maps. Or, if you prefer, you can use the left navigation menu.

After choosing a country, you get a list as a table where key information is summarized for each planetarium with a small image, but it is only first step! If you want to know more, simply click on the image and you will reach the planetarium's own particular page. On this page you will find additional information and three pictures to show both outside the building and under the dome. A general view of the room allows a glance to see if the room is oriented or if the dome is tilted, if

there is an optical projector or not, and more. From the home page, look for the Google Earth icon, where you can download the kmz file that will allow you to view all the planetariums on Google Earth. A click on the link in the tooltips in Google Earth lets you directly open the planetarium's custom page. What new in the WPD are:

- The annual attendance: a figure not easy to get, especially if the planetarium is located in a larger structure (museum or other);

- The make and model of the dome;
  - A page of news added on the home page's left navigation; here you will find brief notices of planetariums under construction, renovation, upgrading or conversion to digital systems and other changes, including the leading provider of the installation;
  - A link to follow the site on Twitter;
  - An internal search engine; and
- Coming soon, the number of people working in the planetarium (staff). ☆



The entrance to the planetarium with a fringed curtain of eelgrass to draw the audience in. Photo: Jens Riggelsen

(*Seaweeds, continued from page 21*)

ious designs and moved around in the surround field in accordance with the six-angled structure. The interplay between each motif gradually forms a sonic unity, with symbolic reference to the oceanic ecosystem, where each tiny element plays a part in the boundless whole.

### A tie-in with biology

It is possible to combine a visit to the plan-

etarium with an introduction or a conclusion of a biology course. The book *Sea Plants* is suitable for education in biology, both for elementary school and high school levels, but unfortunately it is all in Danish. The show has been running for more than half a year as part of the daily program, but it has also been possible for a class to order it special.

The few examples presented in this article illustrates how a direct implementation of both physical and abstract space, in this case the planetarium and the ocean, can be used as a compositional structuring principle in order to create and emphasize thematic and acoustic cohesion. Furthermore, the installation exemplifies the outcome of a renewed attitude towards the use of the planetarium, its architecture, media technologies, and potential as a science mediator, which avails and reconceptualizes the potential of the unique planetarium space.

By daring to use the planetarium for an audio-visual installation, filling the dome with sea plants, and filling the room with composed water sounds, we hopefully have the possibility of reaching a different audience, surprising visitors and awaking the curiosity of music, science and nature in a new way. ☆



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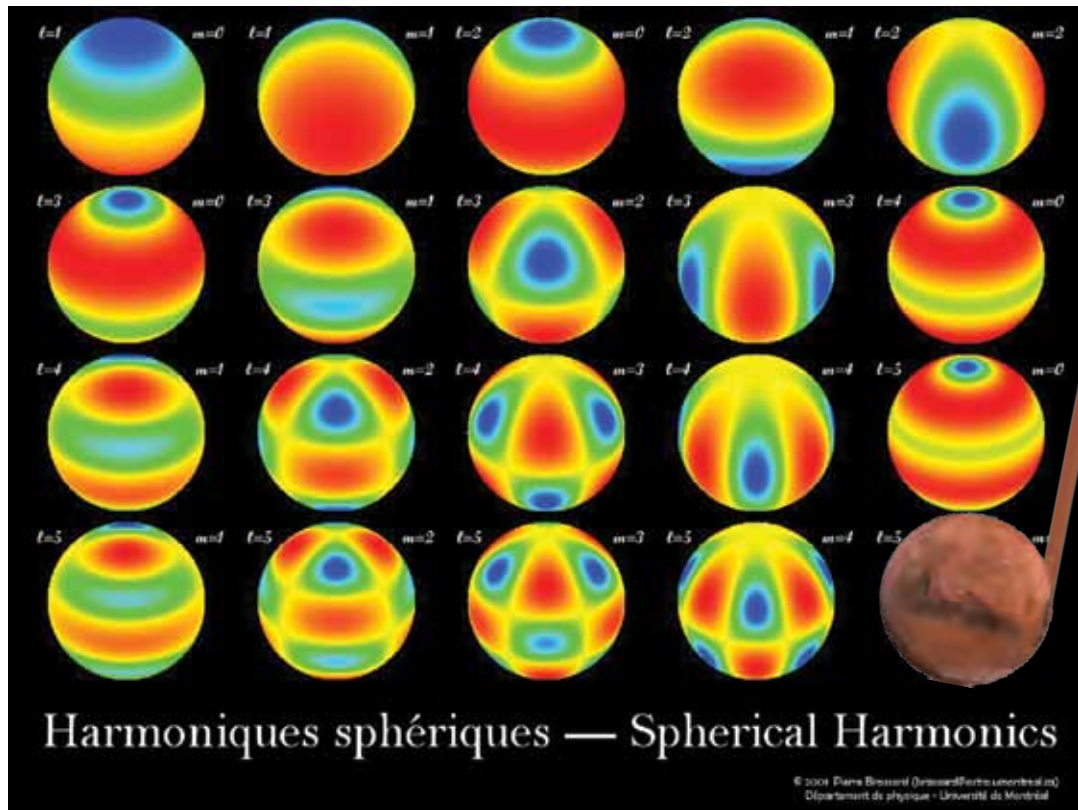
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# *The new Music of the Spheres*

Sylvie Vaclair, Professor Emeritus  
 Institute for Research in Astrophysics and Planetology  
 Toulouse, France  
[www.sylvievaclair.fr](http://www.sylvievaclair.fr)

The relationship between astronomy and music is interesting in many aspects. It enlightens the way scientific knowledge evolves. For the ancient Greek philosophers, like Pythagoras, Plato and Aristotle, the musical theory was conceived in symbiosis with their representations of the global world.

Their knowledge of the sky and the universe was limited to what could be seen with naked eyes. They separated stellar objects in two classes, the “fixed stars,” which came back every night with a time delay but at the same place with respect to each other, and the “planets,” which moved among the other stars.

These planets included the moon and the sun, so that there were seven of them as a whole. They were classified according to their distance to the Earth, which was evaluated from their celestial motions: moon, Mercury, Venus, sun, Mars, Jupiter, and Saturn. The sun stood in a particular position, right in the mid-

dle, as a central pillar of the whole system.

The structure of the universe was conceived with a spirit of harmony, order and plenitude. All planets were perfect spheres, moving along perfect circular orbits around the Earth. This representation of the universe, which began with the Pythagoreans around 500 B.C. and continued with many philosophers, like Plato (428-348 B.C.) and Aristotle (384-322 B.C.).

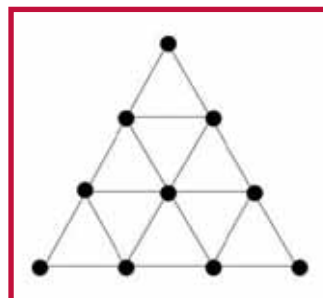
In parallel with their own description of the world, the Pythagoreans also studied mathematics and music. They were especially interested in the characteristic sounds obtained with vibrating strings and found interesting musical intervals when dividing the string length by precise numbers, from two to four. They did

not go further than four, probably for the reason that the total sum  $1+2+3+4$  is equal to 10, a “perfect number,” a symbol of plenitude, as found in the figure of the Tetraktys.

The Pythagoreans discovered the basic harmonious musical intervals, the “fourth,” obtained with a string limited to three fourth of its length, and the “fifth,” obtained with a string limited to two thirds.

In our modern musical language, if the first note is a C, the “fourth” note is an F and the fifth, a G.

Using these intervals, the Pythagoreans built a musical scale which, with some modification, is still the one used in occidental music. The scale included seven musical notes; there were seven planets in the sky. The temptation to associate each note



The Pythagorean Tetraktys

Facing page: Spherical harmonics. Blue and red zones vibrate in phase opposition, yellow circles do not vibrate. "l" represents the number of circles. Some circles cross the poles—like meridians, their number is "m". © Pierre Brassard, département de physique, Université de Montréal, Canada, used with permission.

to each planet was strong, and the Pythagoreans did it. The "Music of the Spheres" was born. It came as an expression of their will to be surrounded by a perfect and harmonious universe.

Perfection does not exist in the real world. These beautiful theories suffered from defects and hiatus, both in astronomy and in music.

At that time, the fact that some planets did not show a real perfect circular motion around the Earth was already known. The planet Mars, for example, sometimes moves in a retrograde way, which is difficult to explain in this context.

It was also clear that music did not behave as pure arithmetic. The musical scale, which is built as a succession of fifths intervals, is not totally consistent. It leads to a final note slightly different from the direct transposition of the first one.

This small difference was referred to as the "Pythagorean's comma." Most Greek philosophers preferred ignoring these defects in their theories, in astronomy as well as in music.

There are, indeed, two possible attitudes in front of such problems, which are interesting to analyze in the framework of the evolution of knowledge.

## Two philosophies emerge

The first one is that of Plato and Aristotle. It consists in refusing observational evidences and only accepting the perfect theories elaborated by the human mind. The philos-

opher Simplicius of Cilicia referred to Plato's thoughts in this way: "What are the circular and perfectly regular motions which may be taken as hypotheses, so that we can save the appearances presented by the wandering celestial bodies?"

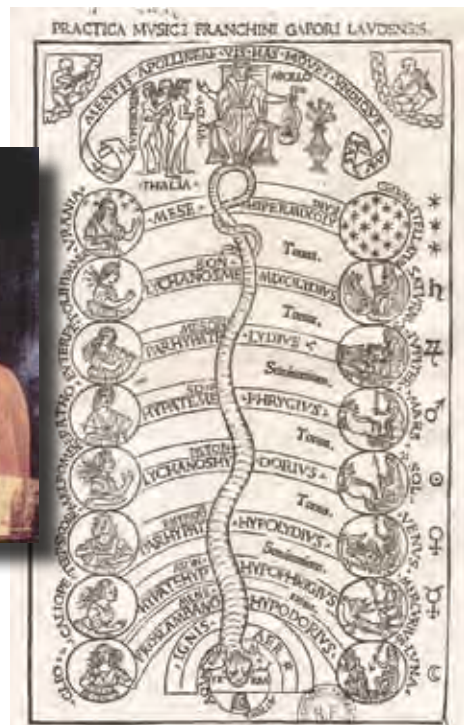
In music, Plato did not want to hear from "these nice musicians who persecute and torture the strings by twisting them on ankles (...) because they do the same thing as the astronomers (...) they do not rise up to the problems which consist in wondering what are the harmonious numbers and those which are not..." (*The Republic*, book 7, French translation by Victor Cousin, translated in English by myself.)

The second attitude is that of Aristarchus of Samos (310-230 B.C.). It consists in taking the "defects" as an instructive information, which must be studied in detail for a better understanding of our world.

This attitude led Aristarchus to propose the first heliocentric model of the universe. He claimed that the world could be better explained if the Earth was a planet like the other ones, all of them orbiting around the sun. This is attested by Archimedes of Syracuse in his book *Arénaire*.

Aristarchus was the only one among these philosophers to follow a real scientific approach, in a similar way as now done in modern science. It took then 18 centuries for his theory to be accepted.

We now know that the antique "Music of the Spheres" does not exist. Neither the Earth nor the sun are at the center of the universe. There is nothing, indeed like the center.



Top: *Practica musice Franchini Gaffori laudensis*, 1496, by the monk Franchinus Gaffurius (1451-1522). Engraving with fixed Earth (at the bottom), the seven known planets ordered by distance (right), associated with the seven "Muses" (left), plus Thalie (for the Earth) and Uranus (the firmament). A musical mode is associated to each planet. Left: *Portrait of a Musician* by Leonardo da Vinci, possibly Franchinus Gaffurius. Reproduction in public domain; Wikipedia.

When this modern evolution of knowledge began entering the human mind, the musical and astronomical theories remained bound only for a short while, when the astronomer Johannes Kepler still thought of the world as a perpetual concert. Later on the representations of the universe evolved dramatically and the musical and astronomical theories went apart, except for the fact that astronomy always inspired musicians

(Continues on page 30)



Above: The musician Claude-Samuel Lévine and the author playing a duet of theremines, the only instrument played without touching anything. ©Claude-Samuel Lévine, used with permission. Right: Musical score by Claude-Samuel Lévine on his computer screen.



de·tail

di'tāl, 'dētāl

noun

plural noun: details

an individual feature, fact, or item.

se·duc·tive

si'dəktiv

adjective

tempting and attractive; enticing.

seductive+details: attractive facts that might distract from learning

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# The effects of seductive details in an inflatable planetarium

## Introduction

The planetarium has undergone an evolution in delivery (Yo, Chaplin, & Goldsworth, 2011). No longer do some planetariums use analog projectors to display the stars, but rather use digital projectors to create immersive cosmic environments on a grand scale using a multimedia format of images, video, sound, and narration (Rosenfield et al, 2010).

Does this new method of delivery provide a benefit to the audience? Are the strategies employed to instruct the audience effective? Which strategies, if any, deliver optimal learning conditions?

## Cognitive theory of multimedia learning

Richard Mayer (2009) developed twelve principles of multimedia learning, known as the cognitive theory of multimedia learning or CTML, for dealing with learning based on the plethora of modern electronic delivery choices. CTML assumes that “people learn better from words and pictures than from words alone” (Mayer, 2009, p. 1). It was founded on the science of learning, which is a change in knowledge based on experience (Mayer, 2008).

Learning is comprised of three cognitive

processes: (a) selecting relevant material, (b) organizing the material into understandable models, and (c) integrating the material with prior knowledge (Lusk, 2008).

CTML supposes three design elements. First, humans process material using dual-channels (Ozdemir, 2009); humans have one incoming channel for visual information and another for verbal information (Austin, 2009).

Secondly, humans have limited capacity for processing information while learning (Mayer et al., 2008). Think of each channel as a pipe. Each pipe has only a certain diameter through which material can pass through. If too much information is pushed through the pipe, the human mind rejects the extra material, and it is never learned.

According to CTML, material can be delivered through the auditory channel and through the visual channel without any limiting effect (Mayer, 2010). Looking at a diagram and reading accompanying text may overload the visual channel, while looking at the same diagram but listening to narration processes the material through dual channels resulting in effective learning (Mayer, 2009).

Finally, humans engage in active processing, which depends on the learner's cognitive

function (selecting, organizing, and integrating) at the time of learning (Harskamp et al, 2007).

Learning can be a demanding experience. Cognitive load is the stress placed on the learner to acquire new knowledge and is limited by the available resources at hand (Lusk, 2008).

Fortunately, CTML has three major strategies to manage this stress (Harskamp et al, 2007). First, the instruction needs to reduce extra or unnecessary learning, known as extraneous processing (Mayer et al, 2008). Any extra processing within the human mind does not aid in the creation of mental models. Focusing on the relevant material provides less crowding of the dual channels involved in cognitive processing.

Second, instructors need to focus entirely on the main idea being taught and use successful learning strategies, referred to as essential processing (Park et al, 2011). The greater number of elements that need to be learned in a lesson, the higher the essential cognitive load.

Finally, the material needs to be presented in a manner that makes sense to the learner, often called generative or germane process-

ing. Generative processing is the mind's ability to make sense, organize, integrate new material [schema acquisition], and is influenced by presentation design and focuses the learner to create mental models of the material (Lusk, 2008).

CTML forms the umbrella for twelve principles of designing instruction for multimedia education (Mayer, 2008). Extraneous processing (unnecessary material) is reduced by (1) coherence, (2) signaling, (3) redundancy, (4) spatial contiguity, and (5) temporal contiguity principle (Mayer, 2009).

Essential processing (main idea) is managed by (6) segmenting, (7) pre-training, and the (8) modality principle (Mayer, 2010).

Generative processing (mental models) is fostered by the (9) multimedia, (10) personalization, (11) voice, and the (12) image principle (Mayer, 2009), see table 1.

### Coherence principle/ seductive details

Within the context of this study, the coherence principle was applied to student learning in an inflatable planetarium. The coherence principle states that people learn better when unnecessary information is omitted from instructional design (Austin, 2009). This needless material is referred to as seductive details (Lusk, 2008).

Seductive details may take the form of graphic narratives of people struck by lightning, while teaching a lesson about lightning formation (Mayer, 2009), or anecdotal stories involving sexual harassment (Towler, 2009).

According to CTML, the brain will use its limited cognitive resources and focus on the more interesting seductive details at the expense of the learning goal, commonly referred to as the seductive detail effect (Mayer et al., 2008).

The foremost theory for including seductive details in educational text is the arousal theory (Mayer, 2009). Arousal theory (Weiner, 1990, 1992) is the notion that students learn best by being emotionally interested in the learning material.

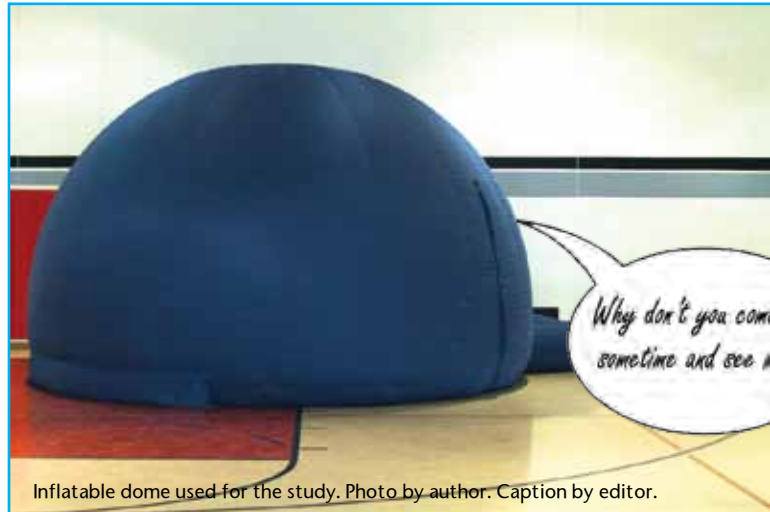
This higher level of interest should translate into better attention and reward the learner with a better understanding of the material (McCrudden & Corkill, 2010).

Arousal theory is based on the model of knowledge transition—information is transferred from the teacher to the student, whereas CTML is based on the belief of knowledge construction—the students actively build the knowledge base in their own minds (Mayer, 2009).

It is believed that seductive details harm

learning in three ways. First, seductive details divert the learner's attention away from the learning goal and cause increased attention to be spent on the seductive details (Mayer, 2009). The learner focuses on the seductive details at the expense of the learning goal. Within a lesson, seductive details appear as interesting factoids designed to catch the attention of the student and possibly increase learning.

Second, seductive details disrupt the cre-



Inflatable dome used for the study. Photo by author. Caption by editor.

ation of mental models based on the learning goal (Ozdemir, 2009). Seductive details may insert themselves incorrectly into cause-and-effect chains (Mayer, 2009). This disruption in formation of a correct mental model is known as the coherence break hypothesis; seductive details break comprehension and interfere with the learner's ability to construct accurate mental models of the learning goal (Lehman et al., 2007).

Third, the learner may incorrectly assume that the seductive details are the learning goals and construct their mental model around the seductive details, at the expense of the true learning goal (Mayer, 2009). This is referred to as the inappropriate schema hypothesis; the mental model is created around the seductive details and not the learning goal (Lehman et al., 2007).

In an attempt to increase retention of material learned in the planetarium, Fisher (1997) inserted humor related to pop culture every ninety seconds during a 15-minute planetarium lesson. The prediction was that humor would relax the participants and provide greater recall of the material.

Participants who did not experience the humor scored higher than those that did. In fact, the humor acted as a distraction and prevented the subjects from learning the material. The humor represented a seductive detail, interesting but irrelevant material that did indeed harm the learning goal (Bryant, 2010).

### Research study

This study used an inflatable planetarium dome with digital projection to teach fifth grade elementary students astronomy concepts with and without seductive details. Lessons were constructed around National Science Education K-4 astronomy standards and California Fifth Grade Standards relating to astronomy (California Department of Education, 2009; National Academy of Sciences, 2012; Project 2061, 2012). The pre-test and the post-test, titled The Astronomy and Space Science Concept Inventory (ASSCI), was designed by Project MOSART with funding from NASA's Science Mission Directorate (#NCC5-706) and are specifically targeted for fifth grade students (see Appendix A) (MOSART, 2007).

Each question provided "distractor-driven" multiple-choice answers (DDMC). DDMC tests include popular misconceptions as provided

answers, forcing the test taker to choose between a single correct answer and one or more research-identified misconceptions. In order for this project to be comparable to other CTML studies, reporting of problem-solving means and standard deviations are included along with an effect size (Mayer, 2009).

Lessons were created using Nightshade Astronomical Simulation, which is an open-source platform based on Stellarium Astronomical Simulation, but optimized for use in a planetarium (Nightshade, 2011).

Custom controls and instructions in the planetarium can be recorded and replayed using Nightshade's scripting language, known as Stratoscripts (Nightshade User Guide, 2010). Stratoscripts are an open-source set of computer commands used by the Nightshade Astronomy Simulator software to automate multiple routine directions, allowing the planetarium operator to focus on the audience and not on the equipment (Nightshade, 2011).

### Two groups take part

Two groups participated in the planetarium lesson, with one group experiencing the experimental lesson embedded with seductive detail design elements and the other group participating in the controlled lesson without seductive details.

A total of fifty-six ( $n = 56$ ) 5th grade students were selected based on: (a) attending the orientation, (b) taking the pre-test, (c) submitting a

student accession form and returning a parent permission slip, (d) participating in either the experimental or controlled lesson, and finally (e) completing the post-test.

One hundred and fifteen students, from four classrooms, experienced some part of the project, but only 56 completed every phase.

Students were grouped by their pre-test scores and by their classroom. To alleviate scheduling problems and reduce teacher confusion, students from two classrooms made up the experimental group and students from the other two classrooms made up the control group.

The lesson given to students in the control group was approximately 34 minutes in length and contained five topics: an overview of the night sky, an explanation of the seasons, examples and diagrams of solar and lunar eclipses, a grand tour of the solar system, and a depiction of the lunar cycle. This lesson

These interruptions were at a faster pace than Fisher's (1997) insertion of humor every 90 seconds, with similar end results of interesting material harming learning.

## Results

An initial glance at the results shows that the post-test score did increase compared to the pre-test scores, providing ancillary evidence that learning does occur in the planetarium (see Table 6). The control group ( $\bar{x} = 55\%$ ,  $sd = 14$ ,  $range = 54$ ,  $var = 218$ ) had a larger gain in learning by 12 percentage points than the experimental group ( $\bar{x} = 47\%$ ,  $sd = 22$ ,  $range = 85$ ,  $var = 490$ ) with a gain of five percentage points, indicating that a larger amount of learning was achieved by excluding seductive details with the control group than by including seductive details with the experimental group.

This provides initial evidence that seduc-

a medium effect would be greater than .3 but less than .8, and a large effect would be greater than .8 (Cohen, 1988; Mayer, 2009). If the effect size is large or medium then there is a relationship between seductive details and learning; conversely, if the effect size is small, then the relationship between seductive details and learning is quite small (Mayer, 2009).

When comparing the two post-test means, an effect size of .4 ( $d = 0.4$ ) denotes that a medium effect was observed between the two post-test means. This suggests that the exclusion of seductive details had a medium-sized effect on learning. Student learning was harmed by the inclusion of seductive details. Placing this into perspective in regards to the post-test means, 20 students (71%) in the control group ( $n = 28$ ) outscored the mean score for the experimental group. Only 10 students (36%) in the experimental group ( $n = 28$ ) outscored the mean score for the control group, indicating

that the control group performed significantly better with the exclusion of seductive details.

## Conclusion

According to the findings, the control group (lesson excluding seductive details) scored better than the experimental group (lesson included seductive details). Therefore, these results validate the research hypothesis.

The data also provided an answer to the research questions by demonstrating that CTML, when applied to planetarium instruction, does cause an increase in learning and that seductive details do have a negative effect on learning.

These results are in line with the predictions of CTML (Mayer, 2009), that the control group (no seductive details) will outperform the experimental group (se-

ductive details included) on assessment performance tests and that the inclusion of seductive details may have increased student attention, but this increase in attention did not translate into higher test scores.

The evidence for this conclusion is the increase in the post-test mean scores between the experimental group ( $\bar{x} = 47\%$ ,  $sd = .22$ ) and the control group ( $\bar{x} = 55\%$ ,  $sd = .14$ ). This increase can be summarized by the size of the effect ( $d = 0.4$ ) between the two groups.

With these results in mind, it is reasonable to conclude that planetarium instruc-

*(Continues on page 30)*

CTML Design Principle	Explanation	Cognitive Processing
Coherence	Extra information is excluded from the presented lesson	Extraneous
Signaling	Important and relative information is emphasized	Extraneous
Redundancy	Material is presented as graphics and narration versus graphics, narration, and printed text	Extraneous
Spatial Contiguity	Related words and pictures are presented closer together	Extraneous
Temporal Contiguity	Narration and pictures presented simultaneously	Extraneous
Segmenting	Learner is able to control the pace of the lesson	Essential
Pre-training	Outline the relative learning goals prior to the actual lesson	Essential
Modality	Pictures presented with spoken words as opposed to written text	Essential
Multimedia	Words and pictures are better than words alone	Generative
Personalization	Informal rather than a formal language style	Generative
Voice	Human voice is better than a computer synthesized voice	Generative
Image	Image of the narrator is superimposed over the lesson	Generative

**Table 1 - CTML Design Principles (Mayer, 2009)**

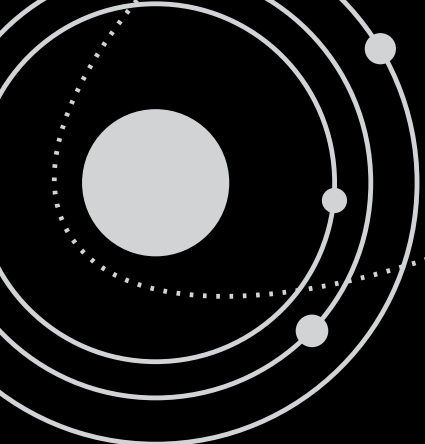
was designed without any distracting seductive details.

The lesson presented to the experimental group contained the exact same design elements with the inclusion of seductive details. These seductive details were represented by 53 images and approximately 27 deviations from the control lesson script. These extra seductive details translated to an additional three minutes of instruction, for a total run time of approximately 37 minutes (see Appendix C).

On average, a seductive detail image interrupted the lesson every 40 seconds and script deviations were experienced every 78 seconds.

These interruptions were at a faster pace than Fisher's (1997) insertion of humor every 90 seconds, with similar end results of interesting material harming learning. The mean score of the control group ( $\bar{x} = 55\%$ ) and the mean score of the experimental group ( $\bar{x} = 47\%$ ). By subtracting the experimental group mean from the control group mean and dividing by the Pooled Standard Deviation (SDpooled) of 18 yields an Effect Size ( $d$ ) of .4, see Equation 4. Effect Size is published as a value between 0 and 1, so the decimal equivalents were used in calculating.

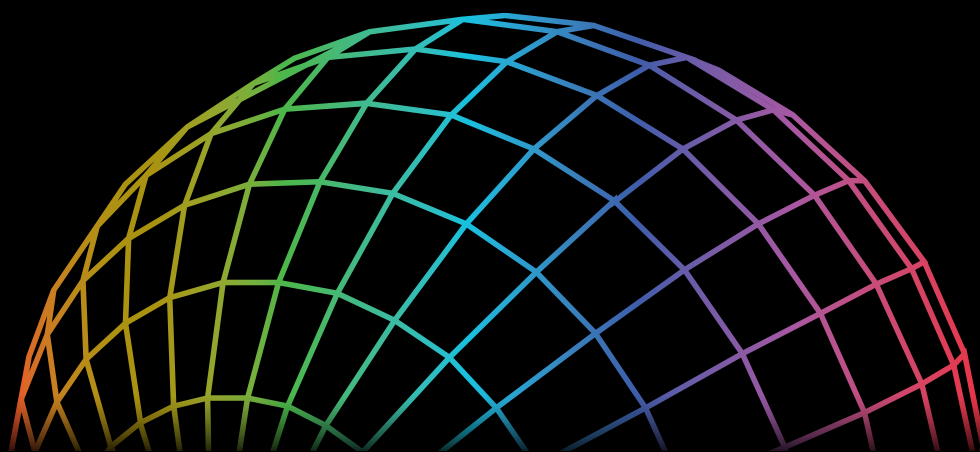
Swaminathan, Horner, Rogers, and Sugai (2012) define effect size as measuring the magnitude of the opposing results using standardized units. A small effect would be less than .3,



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(Seductive details, continued from page 28)

tion consistent with the design principles of CTML does cause an increase in learning and seductive details do have a negative effect on instruction.

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(Music, continued from page 25)

And then came, as a great surprise, the evidence of the acoustic oscillations which take place inside the sun. They were first observed in 1961 as a small vibration in the solar light.

The explanation in terms of acoustic resonance was given 10 years later. Astronomers discovered that these surface vibrations were the signature in optical light of pressure waves travelling inside the sun. Later on, the acoustic oscillations of solar-type stars were also detected, which was the beginning of a new astronomical science, asteroseismology.

The stellar spheres ring because of the acoustic waves induced by the convective zones which are present in their outer layers. The convective motions make noise and create sound waves inside the stars. These waves make the stars vibrate like the resonance chambers of musical instruments.

The scientific analysis of these vibrations leads to unprecedented precision on the determination of the stellar masses, radii, temperatures, ages and even internal structure.

For the sun, tens of millions of overtones may be detected, which leads to a precision of one for one thousand on the values of the depth of the convective zone, the pressure, the density and so on.

The sounds of the stars are not audible for

Volume 1 and 2. American Association for the Advancement of Science, Washington D.C. ISBN 0-87168-668-6 & 978-0-87168-712-8.

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two main reasons. The first one is that space is emptier than the most extreme void that we can have on Earth. Contrary to light, sound waves cannot propagate in the void.

The second reason is that the stellar sounds are very grave, much below the possibilities of the human ears. Astronomers cannot listen to these sounds, but they do observe them.

May that be considered as music? What is true is that stars similar to the sun vibrate like musical instruments, although in a completely different scale. They do not play music by themselves, but they can be used as particular instruments in musical creations.

It is possible to transpose the observed stellar frequencies and reach the domain audible by the human ear. I decided to choose 12 well observed stars, including the sun, and transpose their real frequencies by 18 octaves with their real amplitudes.

With this new stellar scale, the French musician Claude-Samuel Levine composed new pieces of music, quite interesting to listen to. This is the new "Music of the Spheres"!

To hear the music, go to www.odilejacob.fr/catalogue/sciences/astronomie-astrophysique-cosmologie/nouvelle-musique-des-spheres\_9782738130365.php or www.cslevine.com/etoiles. ☆



NARRATED BY BENEDICT CUMBERBATCH

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## Here's looking at you, Glen



Above: Moore with the cast of a dinosaur's jaw in 2000, soon after the Science Centre and Planetarium moved to its current location. Left: Glen Moore with his wife, Elizabeth, outside the Wollongong Science Centre and Planetarium. Photo by Kirk Gilmour, Mercury staff photographer, used with permission.

# Glen Moore retires after 44 years of bringing science to Wollongong

Greg Ellis  
*The Illawarra Mercury*

They say behind every great man there is a great woman.

And when a great man singles his partner out for supporting him every step of the way and saying it would have been impossible without her it is a relationship worth celebrating.

When Glen Moore retired last week after 44 years at University of Wollongong—during which he played the leading role in establishing Wollongong's Science Centre and Planetarium—he wasted no time in thanking his wife, Elizabeth.

What many people do not know is Elizabeth Moore has worked alongside her husband every step of the way as the Science Centre's retail manager.

"She has been as important as I have," Moore says, to which his wife adds: "We could not have done it without each other."

This week Moore's focus turned to his grandchildren and his own observatory, where he plans on making more discoveries

in his favourite field of astronomy.

The Moores have two children, David and Catherine, and plan to spend more time with them and their grandchildren.

But Moore has nurtured many others, particularly in the field of science.

Without him and two friends—Questacon founder Mike Gore in Canberra, and Adelaide's Investigator Science and Technology Centre founder Barbara Hardy—Australia might not have a science centre of any type.

Professor Chris Bryant, of the Australian National Centre for Public Awareness and Science, describes Moore, Gore and Hardy as the three people who helped give birth to the science centre movement in Australia.

In Wollongong, Moore was able to garner the help of powerful supporters, including former Prime Minister Paul Keating, former Science Minister Barry Jones, former UOW vice-chancellor Ken McKinnon and former state MP Colin Markham.

Despite enormous community support,

Moore says he would not have been able to start the Science Centre without their help. Initially, there was "fairly substantial" opposition, he says.

"It was based around the idea of 'why Wollongong?' and 'why science?'"

Moore, who spent much of his career as a senior lecturer in physics at UOW, started his journey to establishing the Science Centre and Planetarium by introducing university courses in the liberal art style.

They received opposition at the time because they drew students from other faculties.

"In the 1970s, I decided to try and take this idea of science through astronomy further."

Moore says astronomy was popular because it was pictorial and graphic and you could use that to teach about geology, biology, physics, chemistry and even politics.

"This great interest we have in the universe and our origins is something that grabs our attention and is something countries are willing to fund fundamental research into," he says.

Moore, 65, still gets excited about new discoveries, such as one announced last week of an asteroid with rings like Saturn.

Reprinted with kind permission from the *Illawarra Mercury*, Wollongong, New South Wales, Australia; original publication date is May 4, 2014. For the full story, see the *Mercury's* website at [www.illawarra-mercury.com.au](http://www.illawarra-mercury.com.au).

He sees it as frontier knowledge and that is why he is going to continue working in retirement.

Do not be surprised if one day you hear of a planetary object being discovered by Moore.

In the 1970s, Moore also introduced a course through WEA and from that, a Lord Mayor-al Committee was formed and the Illawarra Planetarium Society was born.

"The idea was to promote the concept of having a planetarium in Wollongong," he says.

"In 1976, there was an interesting event that really galvanised the public imagination. That was the total eclipse that passed through Bombala.

"I was involved in co-ordinating some of the overseas visitation for that."

Moore says 1982 was a real turning point for him. He attended the International Planetarium Society Conference in Vancouver with his wife and 3-year-old David, who he took to a new kind of facility in that city that was referred to as a science centre.

"It was a very tiny little place in the basement of a shop," he says.

"David loved it . . . and we were told if you really like this you should go and see what they have in Seattle.

"I drove down there and went to what was called the Pacific Science Centre.

"The attention of a 3-year-old is normally about 30 seconds...but after a full day there I said to him 'what would you like to do tomorrow' and his answer was 'come back here'.

"At that point my mind started thinking, 'there is something else here.'"

Moore realised people of all ages were not just interested in a planetarium, but in science generally.

On his return Moore kept lobbying for a planetarium, but within a couple of years the Illawarra planetarium project proposal fell over because of a change of priorities in the city.

"In 1984, there was a Steel Regional Assistance Program and everybody was keen to build new sources of revenue in Wollongong to overcome the downturn in steel and tourism was seen as one of the options," he says.

"The \$20 million that was set aside for projects in Wollongong was going to be split between planetarium and football. It ended up the money being halved and there simply was not enough money to do both and only Brandon Park was built."

Moore was not going to give up.

In 1986, with Halley's Comet passing close to Earth, the public's attention was drawn to astronomy and more than 30,000 signatures were gathered for a petition in support of a planetarium.

In 1988, Moore managed to get hold of some of the Nissan huts at the old migrant hostel in

Fairy Meadow as a potential site for a science centre and, importantly, gained the support of two influential politicians.

"One was Barry Jones, who was the minister for customs at the time, and [the other was] Paul Keating, who was then the treasurer."

A scheme was hatched whereby anybody exhibiting at Brisbane's Expo '88 could avoid duty and sales tax if they donated goods to the Wollongong Science Centre.

As a result, Moore received donations from the British, German, Japanese and Australian pavilions.

"From that, with some assistance from the university's maintenance staff, we built the first Science Centre at Campus East," Moore says.

"From there it continued to grow."

Moore split time between the Department of Physics and the Science Centre until it moved to its present site as the first building on the Univer-

sity of Wollongong Innovation Campus.

The impetus for the new building came after a major flood in 1998 destroyed many of the Science Centre's displays.

"With the help of a lot of volunteers we got it back up and working and I think the government saw the level of community support," Moore says.

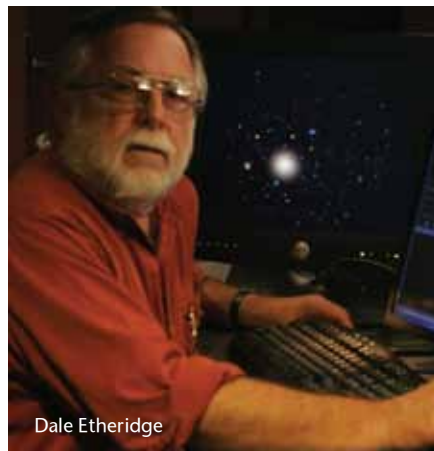
He became director when the new building opened in 2000.

Since then the Science Centre has consistently welcomed more than 60,000 visitors a year, making it one of Wollongong's most popular indoor tourist attractions. Last year it celebrated its one millionth visitor.

Many of those visitors are school students from Sydney and the Illawarra, who get to learn about science through astronomy, just the way Moore likes to teach it. ☆

Find out more at [sciencecentre.uow.edu.au/planetarium.html](http://sciencecentre.uow.edu.au/planetarium.html).

## Dale Etheridge: A lifetime under the dome



Dale Etheridge

Dr. Dale Etheridge, Director of the Planetarium at the College of Southern Nevada in Las Vegas, is retiring after serving 38 years in that position. He will be continuing his involvement with the college as emeritus professor of astronomy.

Dr. Etheridge began his planetarium career at the Griffith Observatory in Los Angeles, California, in the early sixties, first as a guide, then a lecturer, and finally curator of exhibits to end his 11 year association there.

After a brief interval in industry as a scientific programmer, he became the founding director of the planetarium at Mt. San Antonio College in Walnut, California, where he was hired while the facility was still in the planning phase (rare in our field). After four years at MtSAC, he returned to industry while he was completing his doctorate at UCLA.

In 1976, he was hired as the founding di-

rector of the planetarium at Clark County Community College, later to become the College of Southern Nevada. The theater started out as a Spitz 512 facility with an unusual dome design based on ideas from Don Lunetta featuring a hyper-sphere to the floor in front of the audience and a normal horizon behind (a style since referred to as the "Prince Valiant Cut").

In 1986, a Cinema-360 hemispheric film projector was installed enabling full-dome films to be shown. The C-360 projector was removed 10 years later when it became very difficult to acquire 35mm full-dome film products. In the early part of the new century, with the increasing difficulties in finding and using slide-based materials, Dr. Etheridge was able to acquire a grant to remove the aging Spitz projector and replace it with a Digistar 3 SP system in 2005. In 2010, this was upgraded with another grant to a Digistar 5 SP2HD, which has been very popular with the patrons.

As an integral part of the public outreach for the Planetarium (it never did get a naming donor), Dr. Etheridge began publishing the *Southern Nevada Sky Calendar* in 1977. This was replaced with *onOrbit* magazine in 1989 and has been published every month since. Hopefully, *onOrbit* will continue for many more years under new editorship. Through a number of small grants over the years, *onOrbit* is sent free to every public school library in Nevada. Since 2001, *onOrbit* has been jointly published with the Fleischmann Planetarium in Reno, making it the official publication of all of the public planetariums in Nevada. ☆

## *His quest for a national observatory*

# John Quincy Adams' role in American astronomy



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The American holiday of Presidents Day normally focuses on the two best-known names in the country's history: George Washington, the first president, and Abraham Lincoln, the sixteenth, who led the country and was assassinated during the Civil War. It is a relatively new national holiday that combines the birthdays of both men in February, and also has come to honor veterans and local histories.

### Focus on astronomical president

Instead, I would like to reflect on the actions of John Quincy Adams, the sixth president. His role in establishing observatories during our nation's early history played a crucial role in the cultivation of American astronomy. A series of relevant, historical snippets are presented.

Following his stint in the U.S. Senate from 1803-1808 and serving as a professor at Harvard, John Quincy Adams (referred through-

out this paper by JQA) was appointed as America's first Minister to Alexander I, Czar of Russia, in 1809, and they became fast friends. Alexander, being well schooled in astronomy, passed this knowledge on to his friend and Adams, with this exposure, developed a passion for astronomy that he enjoyed for the rest of his life. Within the pages of his diary, JQA recorded what he observed in the sky with his unaided eye or his hand-held telescope.

While serving as Secretary of State (1817-1825) under President James Monroe, a petitioning letter was written by JQA in 1823 to the supporting members of the Harvard Corporation for a world-class observatory to be constructed at Harvard. One of responsibilities as Secretary of State, according to JQA, was to promote "learning," which incorporated the knowledge of astronomy. His petition followed previous efforts to establish an observatory at Harvard.

In 1823 he also offered to fund a Harvard

An 1846 lithograph of the original Cincinnati Observatory building on Mt. Adams. The Observatory went on-line in 1845. This oil portrait of John Quincy Adams was painted by William Powell in 1847 and it has been in the possession of the Cincinnati Observatory ever since. It is the last portrait of Adams before he died in 1848 of a stroke on the floor of the House of Representatives. All photos provided by author.

professorship in astronomy and he pledged \$1,000 "a sum more suited to my circumstances & means than to my inclination..." for the erection of an observatory at Harvard, provided that the remaining, necessary funds to complete the project could be raised within two years. The required funds were not raised, thus he renewed his generous offer in 1825. Yet again, the sufficient funds were not raised and JQA's early efforts to establish Harvard's observatory proved unsuccessful.

Evidently his persistent and oppressive attempt to persuade governmental support, including to the General Court of Massachusetts, for the proposed Harvard Observatory was rebuked by Congress when they created the U.S. Coast Survey. The authorizing bill specified that its funding shall not authorize

*(Continues on page 36)*

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(Adams, continued from page 34)

the construction of a permanent astronomical observatory.

Adams was elected as America's sixth president in 1825 and his first address to Congress challenged Congress to build the country's first national observatory. The "Old Man Eloquent," again, argued the duty and right of government to promote learning, and he emphasized that a significant component of this duty was to erect an astronomical observatory.

"It is with no feeling of pride, as an American, that the remark be made, that, on the comparatively small territorial surface of Europe, there are existing upward of one hundred and thirty of these lighthouses of the skies; while throughout the whole American hemisphere, there is not one."

Adams picturesquely referred to observatories as "lighthouses of the skies," and his States-Rightist political opponents constantly criticized him for his choice of this term.

### Elected to house

After his one-term presidency ended in 1829, JQA was elected to the House of Representatives in 1830, where he served until he died in 1848. To this day Adams was the only former president to ever serve in the House.

During his time in the House, he perceived a need for an observatory to serve practical purposes essential to national interests, such as accurate time determination and the calibration of the navy's chronometers which enabled ship captains to accurately determine their longitude while at sea. JQA failed in his attempt, but his failure was predicated principally by the State-Rightist movement that was in control of Congress, and they did not want to relinquish to the Federal government any monies or power.

Nevertheless, in 1830, he was partially successful in his attempt to found a national observatory when Congress authorized the establishment of the Naval Depot of Charts and Instruments. Their modest astronomical instruments included a Patten transit instrument, a 3.75-inch Troughton transit instrument, and a 3.2-inch Simms refractor.

Other than the Quincy's 1825 attempt to found a national observatory, there had been little interest in American government sponsorship of astronomy, but in 1835, the unusual bequest of an Englishman, James Smithson, resulted in the first government foundation, the Smithsonian Institution, for the general advancement of science in America.

Like John Quincy Adams, Smithson was interested in expanding the scientific knowledge of mankind. He bequeathed his estate to a nephew, who died without an heir, thus forwarding his generous bequest (current production worker value of \$ 256,000,000) was forwarded to the United States.

Congress argued over 10 years as to the ultimate use of the Smithson bequest. As chairman of the Congressional Committee to resolve the dispute over the disposition of the Smithson bequest, JQA petitioned that the bequest be used for a research institution: a "National Institute for the Promotion of Science and Literature" that would include a national observatory and museum. Yet, in Congress' final debate in 1846 on the disposition of the funds JQA sarcastically stated, "I am delighted that an astronomical observatory—not perhaps so great as it should have been—has been smuggled into the number of institutions of the country, under the mark of a small depot for charts..."

JQA chaired a Harvard committee in 1840 to raise funds to convert the Dana house, a private faculty residence on the Harvard campus, into an observatory. The house was modified to incorporate a rotating wooden cupola on top of the residence, eventually to house a telescope. Evidently, as early as the 1820's, JQA had proposed that the land upon which the Dana house stood be considered as a potential site of an observatory.

In 1842 Congress authorized the expansion of the Naval Depot of Charts and Instruments into an observatory and by 1844 the U.S. Naval Observatory was established, when a 9.6-inch Merz and Mahler refractor was acquired.

### Powerful words of support

In his support for the Naval Observatory JQA wrote: "There is no richer field of science opened to the exploration of man in search of knowledge than astronomical observation; nor is there ... any duty more impressively incumbent upon all human governments than that of furnishing means and facilities and rewards to those who devote the labors of their lives to the indefatigable industry, and unceasing vigilance, and the bright intelligence indispensable to success in these pursuits."

By the mid-1840s, the Harvard Observatory had established a Visiting Committee, headed initially by Adams, who served on the committee until his death. The committee exercised influence over the operation of the Observatory.

The country's first public observatory was founded in 1842 when Ormsby MacKnight



Top: The cornerstone that John Quincy Adams laid for the Cincinnati Observatory on November 9, 1843. When the Observatory was moved from Mt. Adams to Mt. Lookout in about 1873, the corner stone was removed from the original observatory and re-laid in the new building, where this photograph was taken. Bottom: The second face of the corner stone that was engraved in 1873 when it was re-laid in the new observatory.

Mitchel's dynamic public lectures aroused the citizens of Cincinnati to form the Cincinnati Astronomical Society and build the Cincinnati Observatory. They purchased the second largest telescope in the world, an 11-3/16 inch refractor, from Merz and Mahler in Munich, Bavaria that very same year. In 1843 they invited the former president to lay the cornerstone of their planned observatory.

John Quincy was 76 years old and in poor health at the time. Despite his family's pleas to ignore the invitation, especially when it required arduous travel from Boston to Cincinnati during November's wintery chill, he accepted and wrote to Mitchel that, "he was on his way and if he was delayed it was not his fault."

On November 9, 1843, JQA laid the Cincinnati Observatory's cornerstone on a hill east of the city in conjunction with an abbreviated, rained-out ceremony. The following day he delivered a two hour dedication oration, essentially a history of astronomy, to 3,000

(Continues on page 42)

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*of kings, and wars, and wines*

## The Great Comet of 1811 left its mark



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Spectacular comets encounter history and mark their eras. For the Great Comet of 1811, this was certainly the case among a number of literary sources, from Balzac to Stendhal, from Musset to Jules Verne, from works of art and caricatures to even wine. Whether it is “Napoleon’s comet,” “Tolstoy’s comet,” or “Tecumseh’s comet,” it continues to be talked about even to this day.

Here is a new celestial reading of facts truly from Earth. Was Napoleon influenced by a comet? As it happens, the comet discovered March 1811 by Honoré Flaugergues from Viviers in the Ardèche region of France was exceptionally visible with the naked eye for nine months, and until August 1812 with astronomical instruments.

The birth of his son Napoleon II—nick-

named l’Aiglon (the Eaglet)—five days before its discovery inspired Napoleon, himself born only a week after the great comet of 1769, a coincidence highlighted in a thesis by Messier in 1808.

By its brilliance and duration of visibility, this comet of 1811-12 was seen as a reflection of Napoleon’s reign and became known as the Imperial Comet for its unsuspected influence on the Emperor. These “hairy stars” appeared to him from then on as his “lucky star.”

With its long orbital period (309,539 years), the comet gained an additional temporal dimension. With its previous passage dating to 1285 BC, during the times of Ramses II, it set up a link with ancient Egypt, which had fascinated Napoleon since his scientific expedition to the foot of the pyramids.

It symbolized a blazing passage from the pharaohs to the new “master of the world,” and as an announcement of invincibility in his conquest of Europe and his decision to attack Russia in 1812 at the summer solstice with the battle of Berezina, which came after a turning point in the destiny of the Empire.

In 1812, two wars engulfed the world: the Russian campaign and the War of 1812, the new-world battle of the United States vs. the British and Indians. Tecumseh, the Indian leader, also had become associated with the comet following the prophecy of the earthquake of New Madrid in the United States.

### Charles Messier and his thesis

Charles Messier, born in Badonviller in 1730, discovered the brilliant comet of 1769 that was visible for four months. He observed it during this entire period and established a map of its trajectory, which he presented to Louis XV. It was christened the “ferret of comets” because its “meddlesome” reputation was already considerable.

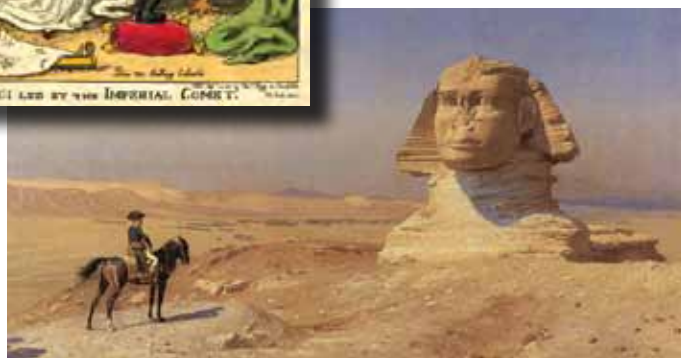
Between 1758 and 1798, Messier discovered 25 comets and observed 45 at the Naval Observatory, located in the Hall of Cluny in Paris.

In order to avoid confusing them with the other nebulous groups he encountered while



Facing page, Left: Napoleon I on his Imperial Throne, an 1806 portrait of Napoleon I of France in his coronation costume, painted by the French painter Ingres. Photographic reproduction of a two-dimensional, public domain work of art, Wikimedia. Center: A watercolor version of Benson Long Lossing's engraving (in wood) of Shawnee chief Tecumseh. Wikimedia. Right: 1811 comet cognac with the comet in the glass seal.

This page, right: Napoléon II Roi de Rome by François Gérard, 1812. The photograph of this painting and the one below were taken by a Wikimedian during the partnership between the Château de Versailles and Wikimédia France. Center: One of the many caricatures representing the comet from the other side of the English Channel, this one "The Gallic magi led by the imperial comet," 1811. Public domain, British Cartoon Prints Collection, Library of Congress Prints and Photographs Division, Washington, D.C. Bottom: Bonaparte Before the Sphinx by Jean-Léon Gérôme.



exploring the deep sky (nebulae, galaxies, and small star clusters which, at the time, were of no interest to astronomers), he produced a famous catalog of 104 of these diffuse objects.

In an astonishing paradox which one encounters sometimes in the history of science, it was precisely this catalog of "unwanted" objects, not comets, which declared his legacy.

Already in his lifetime, the historical context of Messier's glory in comet research was changing at the threshold of the new century. Jean-Louis Pons took over the observatory of Marseille. He was, in fact, devoted to becoming the prize winner of the 600 pounds offered by Lalande<sup>1</sup> for the discovery of the first comet of the 19th century. It was he who would accumulate discoveries from now on.

Messier saw nothing else of his fame during his later years, despite being awarded the Cross of the Legion of Honor. He was even obligated to settle his last rent at the Observatory of Cluny. This may explain why, two years later, he published an eight-page thesis dedicated to the Emperor in which he noted of the coincidence of his discovery of the comet on August 8, 1769 and of the birth of Napoleon on August 15, one week later.

Presented on February 14, 1808, it contained a map of the comet's trajectory, the same that was inserted in his original thesis on the comet of 1769 published in *Memoirs of the Academy of Sciences* in 1775.

But it was, above all, a question of the fact that this discovery coincided with the birth of Napoleon Bonaparte, and at the time of its next return in the course of centuries it would be associated "at the birth and reign of Napoleon the Great, Emperor of France and King of Italy."

Published in 2007 in *International Comet Quarterly*, Maik Meyer analyzed in his study



Charles Messier

<sup>1</sup> Joseph Jérôme Lefrançois de Lalande (1732-807) was a French astronomer and writer. In 1801 he endowed the Lalande Prize, administered by the French Academy of Sciences, for advances in astronomy. Pons received the prize in 1818 for his discovery of three comets that year.

this eight-page thesis, which ruined the image of Messier as a serious astronomer, just like William Henry Smyth, illustrator of excellent drawings of the comet of 1811, noticed already in the 19<sup>th</sup> century how even with its whiffs of astrology, it's "the last comet presented astrologically to the public by an authentic astronomer."

But Messier's thesis begins to play an unrecognized role in the life of Napoleon, since the comet of 1811 appeared in the sky at the time of the birth of the Eaglet, his son Napoleon II. The discovery of the comet by Flaugergues took place five days after the birth of the Eaglet on March 20. According to the "astrological" thesis of Messier, the parallel of this novel coincidence could not escape the notice of the Emperor.

### A link with ancient Egypt

On May 19, 1798, Napoleon left with 36,000 soldiers and 2,500 officers for a three-year campaign. More than 400 ships headed for the ancient kingdom of the pharaohs. The expedition was military and scientific, as 151 scientists took part in the voyage. The famous quote by Napoleon (while speak-

ing to his soldiers) "From the top of these pyramids, 40 centuries look down on you..." illustrates the fascination Egypt held over the Emperor.

Among the most remarkable results, the discovery of the famous Rosetta Stone allowed Jean-François Champollion to decipher hieroglyphics and pave the way for Egyptology.

The 10 volumes of the collaborative work *Description of Egypt*, published between 1808 and 1829, are a legacy of Napoleon's expedition.

Leaving command of the French in Egypt to Jean Baptiste Kléber (who, incidently, was assassinated shortly thereafter), the aura surrounding Bonaparte acquired a new prestige, which paved the way to power, becoming First Council through the coup d'état of the 18th of Brumaire (under the French Republican Calendar, or on November 9, 1799).

These coincidences of the comet of 1769 with his birth and with that of his son were too much for Napoleon to ignore. With calculations giving the comet of 1811 an orbital period of more than 3000 years, it became a link with ancient Egypt, a veritable passage of 3000 years and a symbolic passing of the torches of the pharaohs to the new master of

the world.

To Napoleon, not only do these hairy stars symbolize his “lucky star,” but they also revealed signs of a celestial indicator, like an announcement of invincibility in his military endeavors. The additional argument of the “Imperial Comet,” which is what it is called from now on in the *Gazettes*, suggested to him that he perhaps not yet achieved the full reality of his power.

## The Russian Campaign

Russia in 1812 was rich in raw materials and suffering from a continental blockade that deprived it from its revenue and ability to acquire manufactured goods.

Napoleon’s decision to violate this blockade influenced him towards war. June 22, 1812, the day after the summer solstice (occurring at 15:28:52 June 21, 1812) was the time chosen for his declaration of war and launching of the Russian campaign. The Great Army, with almost 700,000 men, was the most important ever assembled.

The soldiers and the Emperor left for Moscow with the certainty of victory. The rest is history. The Russian cavalry was helped by effective logistics and the first harsh chill of Siberian winter, which caused numerous torments to the French army. The piteous crossing of Berezina has remained memorable.

In total, the escapade cost around 200,000 dead and as many prisoners. As for the comet—which was innocent of wars as much as of grape harvests—continued to travel on its way.

Numerous caricatures representing the comet allegorically ridiculed Napoleon (Bony) from the other side of the English Channel.

The comet appears on objects as diverse as the Imperial Calendar of the leap year of 1812, silver teapots, fans, and even on a Cross of Messanges (Gold Coast), built in 1864 by Andre Picard, a miller, who owed his calling to observer to the comet.

## The other war of 1812

In 1811, only 35 years after the declaration of independence of 1776, the United States was still at the beginning of its history. As in Europe, the appearance of this comet in the sky did not occur unnoticed, and again, as in Europe, it would find itself associated with conflict—the American-English War of 1812, also known as the “second war for independence” or “the war of Tecumseh,” after the name of the Indian chief of the Shawnee tribe who played a key role in the war before being killed in 1813.

The Shawnee tribe was centered in Ohio and Indiana. Today only a few thousand Indians remain. They once saw comets as the cerebral material of the Great Spirit, as they did during the era of the impassioned speech of their charismatic leader Tecumseh and of his

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The Great Comet of 1811 in the background of the miniature painting *The Ghost of a Flea* by the English poet, painter and printmaker William Blake, located in the Tate Gallery, London. This reproduction is part of a collection compiled by The Yorck Project. The compilation copyright is held by Zenodot Verlagsgesellschaft mbH and licensed under the GNU Free Documentation License.

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younger brother Lalawethika, becoming known as “The Prophet” under the name of Tenskwatawa.

Born in Ohio in 1768, Tecumseh, whose name means “shooting star” by comparing him to the speed of the panther, participated in several skirmishes against the Americans in his youth, such as when the Shawnee took the side of Great Britain during the war of independence.

After the Treaty of Paris (1783), which ended the Revolutionary War, the United States obtained the territories between the Mississippi River and the Appalachian Mountains, while the northwest remained in control of the American Indians.

A first war (the Northwest Indian war in the Ohio Country) took place from 1790-1795, which led Tecumseh to refuse the treaty of Greenville, which would have authorized the sale of land to whites and establish a boundary between Indian territory and land open to settlers. The boundary was frequently encroached by settlers.

It was in this context that in 1803 Napoleon sold Louisiana to the United States, adding a vast territory which extended from the Gulf of Mexico to the Rocky Mountains to the new nation.

The war of Tecumseh began in 1811 because of the aspirations of the Shawnee chief who tried in vain to create a confederation of the first Indian Nations, from Canada to Florida. This conflict with William Henry Harrison<sup>2</sup>, governor of Indiana, continued in the war of 1812, which was declared by the United States June 18, 1812 in order to liberate the Canadian territories from the British Empire.

At first an ineffective spectator of this new war, Tecumseh later allied himself with the English, who were already involved in the

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<sup>2</sup> Harrison’s main objective as governor was to allow his settlers to push farther into the West, defending them when Indians retaliated. The major turning point of this campaign was The Battle of Tippicanoe, wherein Harrison led a raid against Tecumseh and his brother.



“Peninsular War,” followed by the invasion in 1807 of Spain and Portugal by Napoleonic France.

## Face off: Tecumseh and Harrison

Tenskwatawa was convinced that the arrival of whites translated into a punishment by the supreme divinity. He started a mystical movement based on the traditions of American Indians. His fulfilled “prophecies” garnered a large response from the Indians. First he made the prediction in 1806 of a solar eclipse, which occurred May 16 that year, but above all, in 1811, he predicted a meteor preceding some cataclysms. This was consecutively confirmed by the visibility of the comet in October and the first pair of New Madrid earthquake in the Mississippi Valley on December 16.

## The earthquake of New Madrid

This tremor and its first aftershocks on January 23 and February 7, 1812 would reach an estimated magnitude of around 8 on the Richter scale, causing thousands of casualties and temporarily changing the course of the Mississippi River. It was the most powerful earthquake registered in the United States outside a zone of subduction.

The fact that New Madrid is very far away from the boundaries of tectonic plates was an enigma which paved the way for speculations by Robert Fritzius in 2005 on the impact of a near-Earth object (NEO) which materialized from a fission of the comet, in conjunction with the observation by Burchell of another  
*(Continues on page 42)*

NARRATED BY LIAM NEESON

# D Y N A M I C EARTH

Exploring Earth's Climate Engine



Public Choice Award  
Short Films  
Espinho Immersive Film Festival 2011



Golden Star Award  
South Korea  
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Award Winner  
Marine Biosphere  
Jena Fulldome Festival 2011



Finalist  
Jackson Hole  
Science Media Awards 2012



Contact: Mike Bruno    mbruno@spitzinc.com    T: 610.459.5200

# A surprising comet prize: The famous wines of 1811



Similarities between both the nonstandard grape harvest and the historic comet of 1811, at its brightest in the beginning of autumn, favored the moniker “Wine of the Comet.”

These bottles carry on this exceptional vintage, with the representation of a hairy star on their labels or their corks when it is not embossed on their glass.

After several years, the harvest of 1811 gained universally appreciated results. Instead of searching for a climatic explanation across a particularly hot and dry summer and autumn, the flattering echoes of “Comet Wine” quickly spread across Europe and the New World.

The massive orders were matched by a demand: The bottles had to be identifiable with a label carrying the distinction “1811 Comet Vintage.” Hand crafted, they represented the first champagne labels, the use of which became widespread some years later, while at the same time stimulating the development of the champagne method by Veuve Cliquot<sup>1</sup>. It was the same for all the regions of fine wines, such as Bourgogne, Bordeaux, the Sauternes, or for bottles of cognac, with the distinction “Fine Napoleon 1811.”

One can understand why the decree of Tsar Alexander I forbidding the importing of French wines after the invasion of Napoleon was not only loosely applied, but even the Tsar allowed himself the pleasure.

The studies of Emmanuel Le Roy Ladurie on the climate in France since the year

1000, through his “manual of grape harvests,” has allowed for faithful enough reconstructions. Since the end of the medieval era it has been a tradition to record the dates of the beginnings of the harvests in the registers.

Ladurie notes that the year 1811 was a hot and dry year. The climate exerted a decisive influence not only on the grape vines and the dates of the harvests, but also on the high quality of the wine.

Thus the “comet wines” of 1811 find an oenoclimatic explanation confirmed by the meteorological records of very warm temperatures in the summer of 1811.

Among the allegorical representations of this grand comet, the good wine is represented, across a barrel dated 1811 in the foreground, with the figure of the comet under the form of a wild and disheveled long-haired fury, armed with burning torches, setting fire to the world and producing earthquakes, volcanic eruptions and other storms.

In literature, a short-story by Ernst Jungner in 1939, *On the Marble Cliffs*, plotted the search for wines of 1811, very much like in *The Adventure of the Stockbroker's Clerk* by Arthur Conan Doyle, where Dr. Watson describes Sherlock Holmes as a connoisseur of comet wines.

In cinema, the 1992 film *Year of the Comet*, a comedic adventure by Peter Yates, referred to the quest and tribulations of a bottle of Chateau Lafite dating from the year of the comet, 1811.

Upon its bicentennial, July 26, 2011, an 1811 Chateau Yquem<sup>2</sup> was put up for auction at the London Ritz by The Antique Wine Company. It was bought for 85,000€ (\$113,000 US) by Christian Vanneque, an old sommelier at the Silver Tower for his new restaurant in Bali. It became the most expensive white wine in the world.

The quantity of important residual sugars, combined with the natural acidity of the grapes, plays the role of preservative. With the years, this long-bottled wine takes on a sweet caramelization and a creamy texture, offering to tasters flavors of lime and orange. ☆

<sup>1</sup> Veuve Cliquot is a luxury vineyard in France, specializing in high quality champagnes. They only use the juice from the first pressing of the grapes, small amounts of sugar, and a special type of fermentation which reduces the acidity of the wine.

<sup>2</sup> Made at the Chateaux d'Yquem, a prestigious vineyard/winery in the Sauternes region of France.

(Comet, continued from page 40)

er comet in 1811 and the notes of Herz in 1893 about his problems explaining its orbit, without confirmation by a meteoric crater.

The current best theory for the cause of the earthquakes is ancient subduction from the time when the supercontinent Rodinia began to split apart some 750 million years ago.

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(Adams, continued from page 36)

citizens. This was the last public lecture that Adams delivered.

In appreciation for his coming to Cincinnati to lay the cornerstone, the city named the Observatory's hill Mt. Adams.

Why did he agree to come to Cincinnati? Not only did he have a passion for astronomy and wanted to support the erection of a significant lighthouse in the sky, but he was also a politician and he was driven by political opportunities. He believed the occasion to be an opportune time to exploit the city's interest in astronomy and build support in the next session of Congress for his version of the Smithsonian Bill.

JQA never had the opportunity to view through the Cincinnati refractor, but he did view through Harvard's great refractor. He died in 1848 of a stroke on the floor of the House of Representatives.

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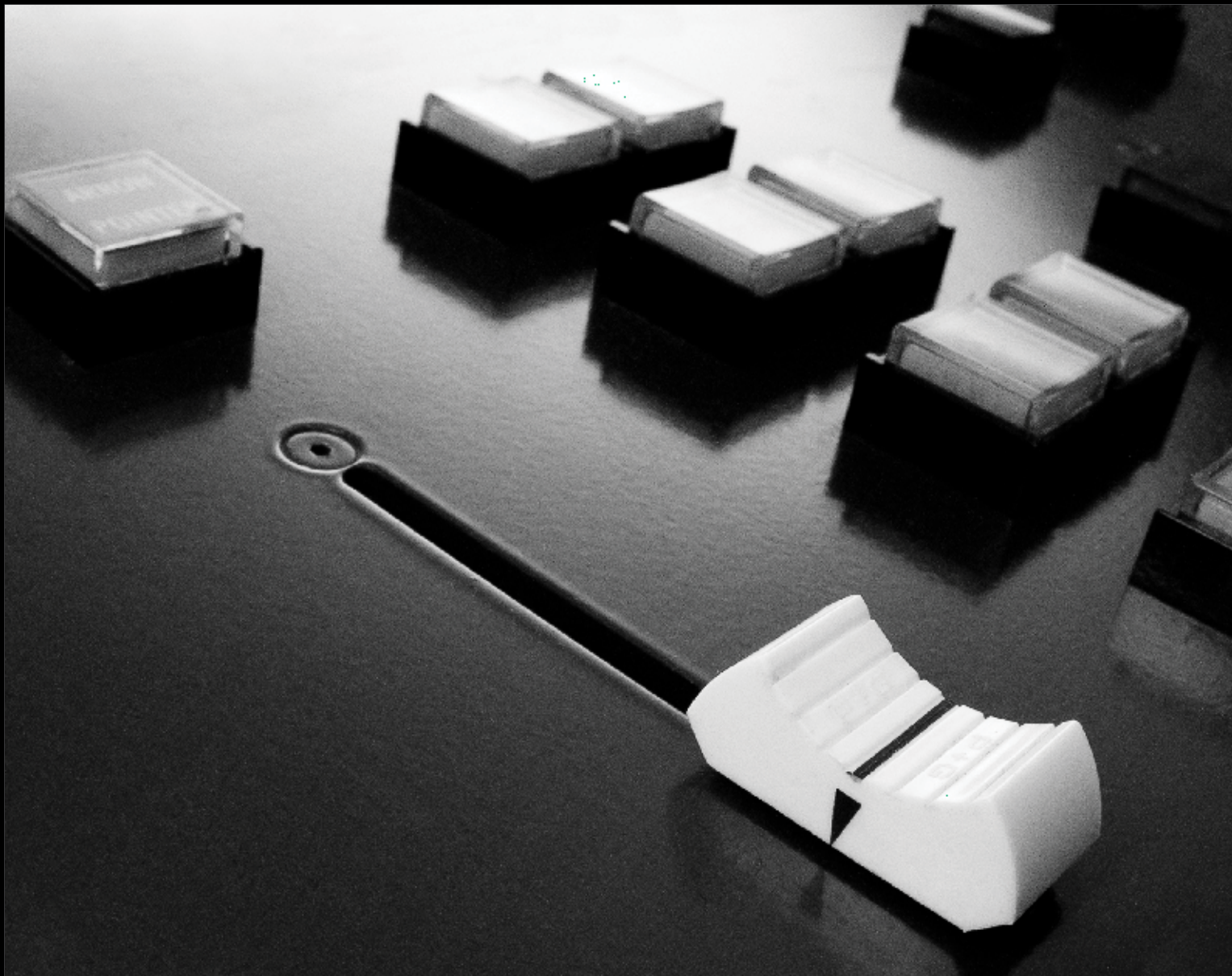
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### The ground beneath our feet: Earth sciences in the planetarium



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What topics belong inside a planetarium and what is beyond the scope of our mission? Are we limited to astronomy?

Imagine you were telling the “Story of Everything,” from the big bang to modern society. This talk would cover any discipline between cosmology, astrophysics, on to geology, paleontology, biology, all the way to history and social sciences. At the end of the hour, you would wish for your audience to walk away with a sense of awe and a glimpse on how everything in the universe fits together with their own life. How far you can walk up this succession of scientific fields without violating your institution’s mission is up to you.

This article looks at the prerequisites to successfully venture “off topic,” reports some exemplary cases where this has been done, and encourages a fresh look at how we can make the most of our domes. We limit ourselves to earth sciences in this article to make the discussion a bit more manageable, though.

#### Why earth sciences?

How do geosciences (geophysics, geology, physical geography, oceanography, meteorology, climatology, glaciol-

ogy) differ from astronomy when it comes to presenting them in a planetarium? We are primarily catering to a different set of viewer expectations, as some examples shall illustrate:

First, there is no prevailing orientation in the cosmos, yet we all have an overwhelming notion of up and down with regard to the ground we stand on. The Earth is layered; we distinguish the inner Earth, landmasses, oceans and the atmosphere. The most interesting stories develop around the boundary conditions between these realms.

The landmasses and, to some extent, the oceans are perceived as two-dimensional, while the other realms are three-dimensional. Therefore, orientation often is key to understanding geoscientific concepts. Tilted domes may have an advantage, since they allow “looking down on the ground” to where we expect things to be.

Second, audiences relate processes on our planet much more directly to their lives, which may make these topics visually challenging. There is no common preconception of what the center of the Milky Way should look like, but we have strong visual expectations towards anything from the outline of a world map down to the physical attributes of a common tree.

Interestingly, many non-astronomical programs in the past have established an artistic style as a technically-manageable visual convention (e.g., a comic style rendering), whereas only few astronomy program producers have felt the necessity to do the same.

Third, the multiple time scales at which geoscientific processes happen are short compared to the time scale of the cosmos. We directly compare geologic time to human

time, comparing sea floor spreading rates to the growth of fingernails. We see our environment change just by watching the news, when natural disasters give relevance to climate change.

Full-dome time-lapse photography has a strong learning effect on audiences when they get a new temporal context for phenomena they know very well but rarely appreciate. For example, the accelerated motion of clouds reveals the stratification of the atmosphere.

#### How do we bring in the data?

The technological requirements for high quality geoscientific visualizations have taken about a decade longer to mature than the astronomical features of digital planetariums, and they still have to catch up.

With the release of Uniview 1.0 in 2005 from SCISS and initial releases of the Worldviewer software from Elumenati in 2009-2011, the capacity to show Earth at high levels of detail became available to full-dome planetariums. The explosion of information being returned from satellites and other remote sensing platforms has increased the availability of geospatial data highlighting any number of Earth phenomena (e.g., see Overpeck et al. 2011 for climate data).

Today, all major planetarium software packages include a high-resolution digital globe of varying degrees of realism. The ability to explore a 3D digital model of the Earth in the dome means that audiences are seeing a high-resolution, visually-compelling representation of Earth, an experience of which may trigger the Overview Effect, an affective response reported by astronauts who viewed Earth from orbit (White 1998).

However, planetarium geobrowsers tend not to have as much functionality as the more widely available web-based software that was appearing for the public at the same time (e.g., Keyhole, which became Google Earth, Microsoft’s Virtual Earth, NASA’s World Wind).

But with minimal abilities to display geospatially-referenced datasets with KML (Keyhole Markup Language) files or to immerse viewers inside panoramic image “bubbles” or hemispherical all-sky images, a new range of educational storytelling opened up.

#### Beyond geomorphology

The next step is the representation of scientific findings beyond geomorphology. At the moment, most systems more or less neglect the ocean basins since their soft-



Digital Earth presentation with Dr. Bob Reynolds at the Denver Museum of Nature & Science in June 2008. Photo by Ka Chun Yu.



A rendering by M. Turk (Columbia University/NCSA, University of Illinois) made with "yt" of a SPECFEM simulation of the seismic wave field after an earthquake, by D. Peter (ETH Zurich). This rendering emphasizes the body waves. Image courtesy M. Turk.

ware architecture is built on the assumption that all features lie above sea level. Recently, Microsoft's WorldWide Telescope (Goodman et al., 2012) has introduced a number of valuable additions, such as import of local high-resolution terrain, georeferenced placement of 3D models and visualization of subsurface phenomena.

Planetarium theaters now have the opportunity to focus their gaze down towards the Earth as opposed to up towards the sky, reflected best in a new catch-phrase from California Academy of Science's Morrison Planetarium, "We put the planet in planetarium." Let us have a look at how a successful canon of programs can be developed around Earth science topics.

### Climate and global change with digital planetariums

The Denver Museum of Nature & Science (DMNS) was one of the first institutions to develop visitor programs with a live presenter that relied on geobrowser capabilities. Equipped with SCISS' Uniview, DMNS worked with Kenji Williams on *Gaia Journeys* in 2007 (which later evolved into Williams' *Bella Gaia*), a program that combined live music and Earth visuals (Yu et al. 2009; www.bellagaia.com).

After a handful of pilot tests in 2007, DMNS began offering a regular bi-monthly live evening lecture series titled *Digital Earth*. Because gross Earth surface features were easily seen in Landsat imagery available from remote WMS (web mapping service) servers, many of the initial *Digital Earth* topics focused on geography, geology, and natural history. Howev-

er, given the expertise and interests of the presenters, there were an increasing number of talks on Earth systems and global environmental change.

These presentations often reflected on global change's impact on humans, as well as the role of human activity in exacerbating such change. Thus, for topics related to freshwater availability, wildfires, and the state of forests, *Digital Earth* presentations highlighted the way that climate and other human-induced change can, respectively, alter precipitation and snowpack patterns, increase the likelihood of droughts and frequencies of fires, and foster the growth of species like mountain pine beetles that are destroying the western forests of North America.

Evaluations and follow-up interviews showed that these programs had substantial impact on attendees. Visitors were impressed by the immersive and real-time nature of the talks, reflecting that the same presentation on a flat screen would not be as enjoyable (Yu 2009). Interest in a topic was heightened for weeks or months after the presentation, which inspired many to learn more on their own (Yu et al. 2010).

Going beyond highlighting the impacts of global change, the Worldviews Network (Yu et al. 2012) takes live planetarium programs one step further to foster dialogues with audiences about how they can be engaged with ecological issues.

The Network is a collaboration between DMNS, the California Academy of Sciences (the Academy), NOVA/WGBH, the design and engineering firm The Elumenati, and the U.S. National Oceanic and Atmospheric Administration (NOAA) Climate Program Office, with funding from NOAA's Office of Education. Informal science

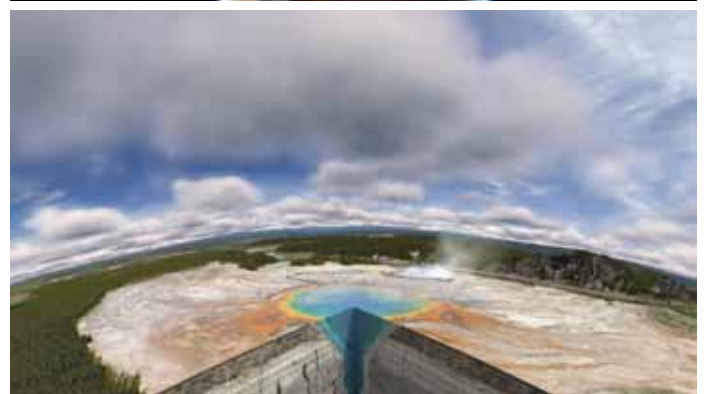
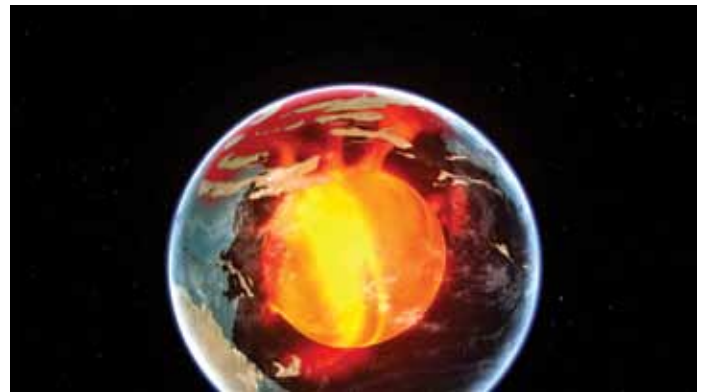
institution partners across the U.S. engage with the Network to develop stories that connect audiences with ecological and biodiversity issues at the local level.

The Network core team works via a one-on-one professional development strategy with staff from a partner planetarium to identify a global change issue that has local impacts, and then to create a narrative with the help of external advisers and experts on this selected topic.

These narratives take advantage of planetarium visualization software's capacity to span cosmic, global, and local perspectives, and to use geospatial datasets to intuitively link the relationships between Earth systems at multiple scales. Although the dome presentations often highlight how ecosystems can be disrupted by human activity, the lecture and the follow-up dialog always emphasize themes of resilience of human communities and natural systems.

By inviting outside experts and advisers into the discussion, audience members are introduced to inspirational solutions to bio-regional problems. Discussions often pivot around how the public can remain involved in resolving the identified problems.

The stories that have been created through the Worldviews Network have been collected on its website (www.worldviews.net) as freely available resources for use by the informal



Visualizations from the program *Supervolcanoes*, top: Formation of the Siberian Traps by a broad plume of rising magma pushing toward the surface. Below: A cutaway animation of Grand Prismatic Spring in Yellowstone National Park, a natural hot water spring sustained by the activity of the Yellowstone mantle plume. Both images courtesy Spitz Inc./Thomas Lucas Productions/DMNS.

science education community. In addition to links to external URLs for additional information for a topic, each event page contains storyboards, narratives, instructional videos, and links to datasets used in the presentation.

Inspired in part by DMNS' *Digital Earth* and Worldviews Network presentations and dialogues, the California Academy of Sciences has been running its live monthly *Earth Update* program in Morrison Planetarium since 2010. Although the initial focus was on news from climate and global change science, the program has evolved into one that highlights the work and activities of researchers at the Academy's Institute for Biodiversity Science and Sustainability, without downplaying the effects of global change.

Again following a Worldviews Network model of showing Earth in its cosmic context, *Earth Update* stories typically start by traveling to various locations in the solar system to emphasize that Earth is the only body to have a biosphere capable of supporting human life. The research stories have covered broad topics such as conservation, biogeography, oceans, and human evolution, as well as more focused natural history topics including ants, spiders, sharks, amphibian decline, and beetle impacts on forests.

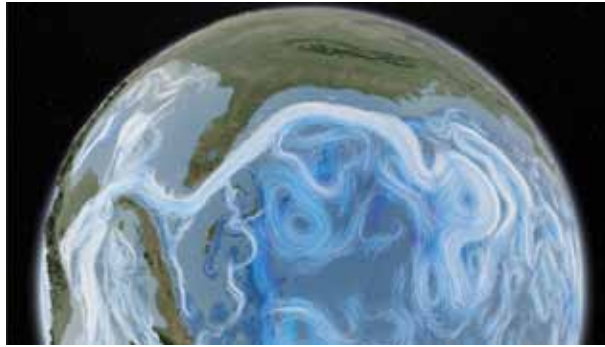
As a live program, it allows presenters to show the most current datasets. In June 2013, shipping lane routes which funnel traffic into San Francisco Bay were updated to minimize the chance of ship strikes between migrating cetaceans and cargo transports. The revised maps were shown to the public in an *Earth Update* program on whales soon after the new maritime rules came into effect, allowing Academy visitors to learn not only about human impact on marine mammals, but ways in which society is mitigating these problems.

Finally, *Earth Update* has highlighted the work of citizen scientists at the Academy and elsewhere. Many citizen science programs involve volunteers using their smart phones to geotag the locations of wildlife they have observed to track changing distributions of species from habitat loss, climate change, or (in the case of invasive species) accidental introduction.

Citizen science groups have had the opportunity to see their collective work visualized on the dome, turning Morrison Planetarium into a display for exploring biodiversity data for a mass audience.

## Seismology on the dome

The SeismoDome project, at the Hayden Planetarium in New York City, is aiming to bring to the dome screen an immersive ex-



From the program *Dynamic Earth*, (top) a visualization of ocean currents and (bottom) Hurricane Katrina by NASA's Scientific Visualization Studio. Both images courtesy Spitz Inc./Thomas Lucas Productions/DMNS.

ploration of earthquakes: what they are, how they shape the Earth, where they come from, and how we might be able to predict them—and, more to the point, why it's hard to do so!

The California Academy of Sciences and Morrison Planetarium developed and debuted a pre-rendered show on a similar topic last year. The SeismoDome project is designed to be more interactive and less formal, and will only be presented a few times at first.

Scientists from the Lamont-Doherty Earth Observatory, collaborating with visualization experts at the American Museum of Natural History, have developed a show concept that ties together both visual representations, as displayed on the dome, and audio representations of earthquakes.

The centerpiece of the show is a series of visualizations and sonifications of simulations of earthquakes. The simulations, conducted by seismologists from Princeton and elsewhere, show the propagation of waves throughout Earth from the epicenter.

The Earth itself is discretized as cubical zones (with a different discretization used where higher accuracy is needed) when the data is visualized, which contains information about the total displacement of each zone of the simulation from its rest position.

By visualizing this total displacement using volume rendering techniques, the two primary types of waves that result from an earthquake can be displayed. The slower, more evocative type—surface waves—are typically

of higher total displacement, and they ripple over the surface of the Earth, focusing at the antipode and generating “wave trains” that—to quote one of the show designers—ring the planet like a bell.

The other class of waves, those that primarily transmit through the body of the planet, are typically of lower displacement and are much more difficult to effectively visualize. These waves, emerging from the epicenter, immediately reflect off the core of the Earth and form complex interference patterns in the hemisphere in which they originate. Simultaneously, they move through the body of the Earth and focus at the other side, causing large scale interference patterns that pulse and move through the body of the planet.

Simultaneously displaying both of these types of waves is challenging, and in many ways becomes more challenging when inside the dome. Typical volume rendering techniques often result in visual confusion, particularly in the dome, where contrast and color must be carefully managed. And, while the location of each class of wave is localized, the spectrum of displacements is

continuous—there is no sharp cutoff where the types of waves transition, one to the other. Attempting to distinguish them thusly can lead to misinterpretations of the data.

While this is going on, sonifications of the waves themselves, sped up enormously over the two- or three-hour timescale of the simulation, share a visceral experience of the earthquake with the viewers. The visual cues, of wave field propagation and magnitude, combine with the subconscious cues of interference patterns and beats from the sonification to describe what's happening to the Earth. The visual and aural cues together give much greater detail than could be done by either one alone.

## Viewpoints are challenging

Choosing viewpoints can be challenging as well. While it's natural to situate the viewer at the center of the Earth (such that the dome represents the surface of the planet), this makes it much harder to distinguish between the surface and body waves, as well as providing something of a disorienting experience as the continents are presented backwards. However, in combination with the sonification, the speaker locations in the dome can be tightly correlated with the location of the virtual seismometers that provide input to the sonifications, and so this is a compelling viewpoint.

For contextualization, and a better understanding of the body waves, the visualization

pulls back and presents Earth floating in space, in what is jokingly referred to as “moon view.”

### But what about *my* planetarium?

The significance of a topic in the full-dome planetarium world can be measured by how many pre-recorded programs have been developed on it. Global change may have enjoyed priority in the adaptation by the planetarium world since it is one of the most rapidly evolving geoscientific phenomena and is even of political significance.

To name just a few productions, think of *Our Living Climate* by Melbourne Planetarium, *Ice Worlds* by E&S, *Climate Change* by Albedo Full-dome or *Dynamic Earth* by Spitz/Thomas Lucas Productions. On to geology and geophysics, the California Academy of Sciences has produced *Earthquake*, a show on the local tectonic regime of the Bay Area and seismic activity in general. This was a clearly non-astronomical project that was largely justified by their own local earthquake threat.

DMNS has been a co-producer of *Supervolcanoes*, a show that ran in parallel with a local exhibition on volcanology. *Dinosaurs at Dusk* by Mirage 3D covers aspects of paleontology, and the majority of their very successful programs treat topics of non-astronomical natural history.

Yet the projects mentioned so far all have been supported by big institutions with large budgets and agendas. What about smaller initiatives? Pre-recorded shows are a good way to test the acceptance of a careful “rebranding” of your institution from a star theatre to a science theatre, keeping in-house efforts low.

Yet the gold standard should be the live presentation and interactive audience engagement. It should not be underestimated that a successful live program on a non-astronomical topic requires substantial knowledge by the presenter.

We may need programs for capacity building and a way to test in advance whether the effort will be well received. Spitz and the Simulation Curriculum Corporation have developed a full earth science curriculum aptly called *The Layered Earth* which provides classroom activities and educational material that

blend with Scidome full-dome visualizations.

Freeware and hardware independent, yet technically a bit more challenging, World-Wide Telescope offers similarly scalable functionality, including an online platform to share and jointly develop real time modules and form partnerships on any level. The data behind the Worldviews programs is also publicly available on the web.

How will geosciences become an integral topic of our trade? Full-dome cosmology teaching only truly got off the ground through the Digital Universe Atlas (the standard toolbox of datasets compiled at AMNH), its first commercial incarnation as Uniview, its demos and success stories, and the adaptation by other vendors because everyone asked for it.

### Need a common data standard

Such an effort has not yet been made for the geosciences. Individual institutions and companies work on isolated showcases and features, accessing different proprietary servers for data. The breakthrough data compilation could once more be stemmed by one entity, but alternatively it could be a group effort of institutions adhering to a common data standard that is fully supported by at least one full-dome system.

An informal survey among existing systems shows that, at the moment, KML (known from Google Earth) does not qualify as such a standard.

We envision a tour of our planet the same way we have come to enjoy the standard magic carpet ride out to the cosmic microwave background coined by Carter Emmart of AMNH: Start out in your home town, zoom out into orbit and let the seasons change over your part of the world. Maybe include a hurricane simulation. While you are at it, zoom out a bit more, talk about ice ages and show the waxing and waning of polar ice caps and pack ice. Notice the rise and fall of the sea level.

By now you have raised the point that throughout the quaternary, sea level change mostly affects the continental shelves. Dive into the ocean, talk about how 71% of our planet’s surface is covered by water, and why oceanic crust is fundamentally different from

continental crust.

Show 3D seismic interpretations, and explain the conveyor-belt-like movement of oceanic crust from the mid-ocean ridges to subduction zones. Have ocean islands burn their way through the crust, leaving tracks of seamounts.

Reveal the convection of the upper mantle as a driving mechanism of plate tectonics and run a paleogeographic reconstruction. Close with the stratification of the Earth by hinting at seismic tomography, how our planet differentiated and how the moon was formed. Get back home, moving fast forward in time.


More or less, you just told the second part of the “Story of Everything.”

### Acknowledgements

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## End of the school year clean up

This school year I had set a goal of going through my past lessons file cabinet. Okay, the goal was set by my principal, who said, "Jack, you can't have another file cabinet."

Going through the drawers, I found lessons that I wrote back in the 90's when I was still in college. Then I found the drawer with lessons from my predecessors dating back to the late 70's and early 80's.

It was a clue that these lessons were very dated when they said "When the planetarium is completed we will..." This led me to a problem: many of these are good solid lessons, save for the ones that are dealing with Pluto as the ninth; how do I judge if they are still useful? I decided to use a three-pronged attack:

- Does it connect to the content standards?
- Does it use educational best practices?
- Does it make the student an active participant in learning?

I found lessons that require slides, which were retired because we have been a hybrid planetarium for several years and I don't run my slide projectors. Some required more time than I am currently allow. Four weeks of observing the moon is fine until you only have the students for three weeks. Let's take a closer look at the three successful requirements.

## Connecting to content standards

If you are Common Core, Next Generation, National, Regional, A-Level or a mixture of these, you need to know what the expected outcome of a visit to the planetarium is. I have some amazing presentations on planets, but if the students are coming to the planetarium to learn about moon phases, that is a problem.

I have all of the astronomy standards broken down by grade level posted in the planetarium and when I have students ask "when are we going to talk about the zodiac," I just have to point them to the poster and ask them to show what standard that topic applies to. It is also a nice preview for students who want to know when they are going to learn about dark matter—you have to wait until 8th grade for that.

## Educational best practices

Are you asking the students or visitors to simply memorize a list of facts, or do you ask them to gain a level of understanding? Memorization and lecture have their place, but how

do you connect the learning to the student's previous experiences? How many times does a student need to be exposed to a term before it becomes part of their vocabulary, and can they define the word using their own words?

I really changed how I teach craters and impacts after I found out that the lesson I was using did not help the students understand that Earth is not currently being bombarded with asteroids. Also, when asked in a pre-activity survey how they would measure a crater, a significant fraction wanted to measure how deep the crater was instead of its diameter.

Are you using a variety of approaches to the topic to help students with a variety of backgrounds? In every group you have that one student who, by luck of the schedule, was in the class the previous year that did no science.

## Active participant in learning

Who is doing the work in your lesson? Are you doing all the heavy lifting? Many of the students who fall asleep during a planetarium presentation are not just tired; they are not active participants in learning the topic. Many presenters are trained to use a hook to grab the audiences' attention away from the "oh my goodness, I am in the dark, my teacher can't see me and I could get away with anything."

Once you have their attention, you can only hold it for about five minutes (personal experience) before you need to reengage them; you can ask a non-rhetorical question, have them predict what will happen next,



Your students' craters will not resemble this one, a dramatic, fresh impact crater image taken by the High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter in 2013. NASA/JPL

share with a neighbor an interesting fact from the presentation, or make some notes.

This year I was fortunate to work with quite a master teacher, Juanita Peterson, on a Reading/Mythology/Astronomy unit. We wrote the unit-name this way because we used mythology as the bridge between reading and astronomy.

The 6th graders read several samples of myths from around the world prior to coming the planetarium. When they arrived, we did the mythological stories for several of the constellations, i.e. how the bears got long tails, Perseus and Andromeda, and Osiris's gathering fish.

They visited for three days, so we were able to establish some procedures to let the students know we were transitioning between topics or had further instruction.

Juanita and I decided to use the planetarium's cove lights be the cues, with red meaning voices off and ready for instruction, yellow meaning 10 seconds to the end of discussion, and magenta for asking ask a person "why did they think it was true."

After the mythological story in the planetarium, the students created their own chimeric creatures to insert into other myths, like "What would Orion do if he woke up next to a half-orangutan, half-cheetah creature?" "Why is Artemis hunting in Africa on a half elephant half peacock?"

Once there story was written, the students were given a blank star field (I zoomed in so that major or known constellations were not visible) and they had to identify the brightest five stars in their own constellation. They could use the stellar classification system to color the star and create a dot-to-dot constellation. This made for a nice natural transition to the astronomy standard they were covering, the Hertzsprung-Russell Diagram and main sequence stars.

## Destruction in Action lab

This edition's lesson is a quick 30-minute activity for craters that I like to use after we see a presentation on gravity and craters.

### Materials:

- Plastic container (shoebox size or larger)
- Salt (enough to fill the container 5 cm deep)
- Computer mouse ball
- 2 golf balls (1 standard, 1 hollow practice)
- 1 video camera (set to its highest frame rate)
- Measuring calipers
- Safety goggles (10 pairs)
- Computer stations (1 per every 2 students) to allow access to [www.uni.edu/morgans/ajjar/Gravity/craters.html](http://www.uni.edu/morgans/ajjar/Gravity/craters.html)

### Procedures:

In small groups, students go to the above website, "making craters," to complete the crater work sheet.

*(Continues on page page 60)*

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## Models of business, convergence at recent IMERSA & GSCA conferences

A diverse, international group of professionals assembled to discuss the present and future of fulldome and immersive media experiences at IMERSA Summit 2014, March 6-9 in Denver. With close to 200 attending, the conference was booked to capacity and registration closed a few days before the event commenced.

The days and nights were full, as were the sessions, screenings, and events. A study of the delegate list reveals that about half of the people who gathered at the Summit and its four venues (Denver Museum of Nature & Science, Sie Film Center, Holiday Inn Denver East Stapleton, and Fiske Planetarium) represented planetariums, museums, science centers, educational institutions, and entertainment companies from the Americas, Europe, and Asia.

Industry press covering the Summit in person included the Fulldome (check) Database (Dario Tiveron), *Informal Learning Review* (Robert "Mac" West), *LF Examiner* (James Hyder), *Stereo World* (Lawrence Kaufman), and *In-Park Magazine* (Martin Palicki).

### People from across the industry

IMERSA actively reaches out to business and arts organizations with complementary interests, and those represented at Summit 2014 included SIGGRAPH (president Jeff Jortner), the Themed Entertainment Association (past president Rick Rothschild of FAR Out! Creative Direction; board member Ann Hathaway of Mousetrappe), the Giant Screen Cinema Association (executive director Tammy Seldon, communications director Kelly Germain and numerous board members, including Berend Reijnhoudt of Omniversum and Toby Mensforth of Mensforth & Associates), SAT (Dominic St-Amant); Producers Guild of America (Kate McCallum of PGA New Media Council), ASTC (IMERSA founding Board member Ryan Wyatt also sits on the ASTC Board), IVRPA (the International VR Photography Association, Joergen Geerds), Fulldome Film Society (Yaroslav Gubchenko), and, of course, IPS (president Thomas Kraupe of Planetarium Hamburg and board member Ian McLennan).



Musia Bus represented the Jena Full-Dome festival, and Markus Beyr and Ed Lantz introduced the new Sphere of Light award competition to foster the creation of fulldome shows on wellness.

This mix of voices played an essential role in the Summit mission to look within and beyond the fulldome community for applicable business models, wisdom, and resources. The kickoff was a collaborative all-day pre-session on best practices, organized by IMERSA and GSCA to strengthen the dialog around convergence between the fulldome and giant screen sectors.

This laid the groundwork for much of the background conversation in the ensuing days and for the continuing conversation between IMERSA and GSCA, which will hold its annual conference in Toronto this September.

Some 80% of the Summit delegates were already on hand the first day to participate in the professional development sessions, which gave an overview of current fulldome production tools and techniques from some of the leading producers and animators in the field.

For its selection of featured fulldome screenings in the Gates Planetarium at DMNS, IMERSA looked to recent industry festivals

(Continues on page 56)



Top: Left to right on the stage: Jonathan Barker, Brad Thompson, Paulina Majda, Annette Sothoran-Barnett, Robin Sip, and Derrick Pitts in a producers' panel discussion at the Gates Planetarium.

Down, left: *Exploding the Frame* author Prof. Ben Shedd (Nanyang Tech University, Singapore) and Joergen Geerds with Freedom 360 gear, at the Dome3D display in the IMERSA Summit Marketplace. Photo by IMERSA.

Down, right: IMERSA Summit keynote speaker Prof. Donna Cox of the National Center for Supercomputing. Photo by L. Brian Stauffer.

Bottom left: Mike Murray of Clark Planetarium points expressively to Fiske Planetarium's retired optomechanical starball, (nicknamed "Fritz" after the Zeiss engineer who installed it in 1975) now on display in the lobby since Fiske upgraded to 8K fulldome. Photo: Phil Groce.

Digital Fulldome and Immersive Media News is a compilation of news and information about fulldome and immersive media. Primary contributor is Judith Rubin, Communications Director, IMERSA.org. rubin.judith@gmail.com





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(Digital, continued from page 54)

and juried competitions, presenting their top awarded shows. From the results at the Jena FullDome Festival, FullDome UK, Russian FullDome Festival, DomeFest, Jackson Hole Wildlife Film Festival, GSCA awards, Imiloa FullDome Festival, and Japan's Dome Festa came the featured titles, *Dream to Fly*, *MUSICA*, *To Space and Back*, *Supervolcanoes*, *Dinosaurs at Dusk*, *The Life of Trees*, and *Flight of the Butterflies*. A full day was devoted to case studies from the producers of featured shows, revealing a wide range of filmmaking approaches and techniques.

## A setting designed to share

The Summit strove to create a setting of camaraderie and cross-fertilization for sharing tools, information, models, and inspiration to attract more creativity, innovation, and financial resources to the fullDome world. By positioning the fullDome niche within the larger context of family leisure offerings, IMERSA helps theaters and content creators to become more competitive.

Sessions such as “Research Bytes” and the “International Innovators Forum” reinforced this strand, helping to formulate a bigger picture of industries in transition—and new industries forming—with common goals and challenges. For instance, the Innovator’s Forum summed up with a call for dedicated arts and entertainment domes to serve the growing number of artists, performers, and innovators seeking access to this growing format.

Jeri Panek of Evans & Sutherland became the second recipient of a lifetime achievement award from IMERSA, celebrated for her achievements as an industry evangelist who brought digital technology to the planetarium field and created the basis of today’s fullDome community.

Panek understood the opportunity that computer graphics represented to planetariums and was able to articulate it successfully to others, driving a transformation that began with the very first Digistar I sale to the Science Museum of Virginia (via then-director Paul Knappenberger) in the early 1980s.

At the banquet in Jeri’s honor, IPS President Thomas Kraupe of Planetarium Hamburg, Mark Webb of Chicago’s Adler Planetarium, Ian McLennan, Mike Murphy of Salt Lake City’s Clark Planetarium, and Steve Savage of Sky-Skan were among those who spoke about her to the crowd, and then Ms. Panek herself took the podium to share her own first-hand stories and recollections.

## The golden age of visualization

As keynote speaker, Dr. Donna Cox of the National Center for Supercomputing, inspired delegates by declaring and demonstrating that we are in the midst of a “golden age of sci-



Left: IMERSA leadership presents Jeri Panek with the Lifetime Achievement Award. Left to right: Michael Daut, Panek, Ryan Wyatt, Ed Lantz, Judith Rubin, and Dan Neafus. Photo: Ben Shedd.

Below, left: At the Sie Film Center in Denver, IMERSA Summit delegates explore a display of stereoviews. Photo: Mie Kosaka.

Below: Tammy Seldon is executive director of GSCA, which is collaborating with IMERSA on industry best practices.



ence visualization” in which art, media, data, and science intersect. Pretty pictures, yes, but along with the astounding aesthetic achievements, modern datasets are empowering new ways to present data for education, analysis, and storytelling.

After several days of sessions, the very first IMERSA Marketplace opened its doors for a half-day and was abuzz with a full house of tabletop exhibits, allowing delegates to network and conduct business.

The collaborative talks continued with inspiring presentations on storytelling and immersive media from Ryan Wyatt and themed entertainment producers Rick Rothschild and Daren Ulmer (Mousetrappe). This panel helped to illustrate how projects in domes and immersive theaters, science centers and space centers, some using projection mapping and some integrating ride systems, are close cousins of what’s going on in planetariums.

Probable and promising game changers shared at the Summit included WorldWide Telescope (presented by Doug Roberts of Microsoft Research); the ever-present and intriguing Oculus Rift headsets, and the demonstrations of high frame rate 8K projection at Fiske Planetarium.

Delegates boarded buses to Boulder for the Summit’s grand finale, generously hosted by Fiske in its handsome, recently upgraded theater with a chevron seating plan, 65-foot diameter screen and new Sky-Skan display sys-



tem. A range of viewpoints came out in the “Pros & Perils of 8K,” a distinguished panel organized by Patrick McPike (Adler Planetarium) and Chris Maytag (Fiske), including Staffan Kleshed (SCISS), Andrew Johnston (NASM’s CHECK Einstein Planetarium), Steve Savage, Michael Daut, and Ryan Wyatt.

As an opener to the panel, to depict the considerable challenges involved in 8K production, Paul Mowbray of NSC Creative introduced charts comparing rendering times and showed content with different resolutions displayed side by side.

The demos and screenings that followed, particularly *To Space and Back* in 8K 60 fps, seemed to produce near consensus on the visual evidence that venues in a position to take the 8K leap will find the pros are worth the perils, and that 4K content also benefits from display on an 8K system.

IMERSA’s 2014 Summit, its third stand-alone event in Denver, was driven by the group’s core leadership: the four-person board of Dan Neafus (Gates Planetarium), Michael Daut (Evans & Sutherland), Ryan Wyatt (California Academy of Sciences), and Ed Lantz (Vortex Immersion), with communications/development staff Judith Rubin.

Neafus was in a primary role with his team in Denver, and Daut chaired the professional development sessions.

Altogether, some 20 people, most of them volunteers, worked on various aspects of programming, outreach, and support, representing an expanded organizational structure to help achieve good representation of the industry. Some of those deserving special thanks: Karen Roney, Carolyn Collins Petersen (Loch Ness Productions), Ethan Bach (Vortex Immersion), Brian Wirthlin (Seiler Instruments/Carl Zeiss), Alan Caskey (Holovis), Mike Murray, Matt Mascheri, Tammy Seldon, Toby Mensforth, Patrick McPike, Chris Maytag and Ian McLennan. Please visit [www.imersa.org](http://www.imersa.org) for more acknowledgments and details.

In 2015, the IMERSA Summit will again be hosted in Denver, with a similar time frame (late February/early March). IMERSA is incrementally publishing some followup materials from Summit 2014, such as various presenters' slide shows and recordings, on the IMERSA website and social media channels.

Next steps for IMERSA following the successful 2014 Summit include seeking the best way to strategically grow the organization; gradually expand its board, advisers network and committees; and plan future collaborations, professional development opportunities, and satellite events. Those interested in getting involved are encouraged to contact an IMERSA board member.

The organization especially welcomes ac-

tive members to participate in the ongoing standards work, volunteer for the 2015 Summit committee, and contribute to the IMERSA presence being planned for SIGGRAPH 2015 in Los Angeles.

### Digital Crossover at GSCA Expo

The 2014 Giant Screen Cinema Association (GSCA) Film Expo took place in Austin, Texas, at the Bob Bullock Texas State History Museum, March 24-25. Of late, the film expo has also embraced digital technology. Within this specialty sector, the changeover to digital technology is taking longer than it has in mainstream cinema because of the challenges to achieve a satisfactory digital replacement for the high visual standard of 1570 film plus the sheer size of the screen.

Some giant screen theaters, mostly flat screen, now have digital projection, but a goodly number still rely on film projection, and so the GSCA screening venue must accommodate 2D and 3D projection in both film and digital. Attendees were supplied with two different sets of 3D glasses (RealD and IMAX). This year's digital projection system was a temporary installation furnished by Electrosonic in collaboration with RealD and Christie.

Production of giant screen content has likewise voyaged into the digital realm—not ex-

actly a new development in the sector, but one that remains controversial, and the controversy seems to have intensified as the 1570 film exhibition format on which the entire industry was originally founded seems on the point of vanishing.

At this gathering, the worst thing one producer could say about another producer's work was that it looked like television, and many were not shy about their use of the "T" word. What they were decrying is not the use of digital capture per se, but a lack of the sweeping visual language that characterizes classic giant screen cinematography. It takes more than a giant screen to make a giant screen experience.

### A parallel to planetarium switch

The plenitude of titles with space and astronomy content made it clear that giant screen distributors are actively cultivating the planetarium market, and most mentioned plans for their new titles to be available in full-dome versions.

With the digital shift, there is new variety available to giant screen theaters, an array of choices that some appear to find a bit intimidating in its complexity. Distributors are likewise facing a brave new world in terms of competition for screen share.

*(Continues on page 60)*

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# Science Museum of Virginia team discusses how their new 8K system changed the way they use “The Dome”



The Dome at the Science Museum of Virginia. Photo courtesy of the museum.

An interview with Jim Peck and Justin Bartel  
By Judith Rubin

On March 15, the Science Museum of Virginia in Richmond re-opened its dome theater to the public, outfitted with a new Evans & Sutherland Digistar 5 8K system. The renovation of this 243-seat theater with unidirectional seating in a tilted, 23-m dome also includes a new Spitz NanoSeam dome. The museum has named it, simply, “The Dome.”

Attendance numbers are up dramatically, and The Dome is making the most of its new versatility. Its cinematic premiere, the full-dome version of *Great White Shark*, has done well, and its “cosmic expeditions” format, which pairs a fulldome science show with a topical, real-time live astronomy presentation, is doing equally well, according to Jim Peck, director, Technology and Innovation.

Certainly the eyes of the museum and planetarium community will be on this 8K digital transformation of a dome that formerly emphasized IMAX films. E&S promotes the play-

back qualities of this D5 8K package as meeting and even exceeding what 15/70 film dome projection can do. “We knew we had a challenge to meet, and this was our opportunity to do it—not just to replace IMAX in a dome, but to provide a system that could do all kinds of things, and do them easily,” says Michael Daut, director of Show Production/Marketing at E&S.

The Museum’s new D5 uses five Christie 4K projectors, selected for resolution, brightness and 120Hz active stereo 3D. The system’s real-time astronomy features display natively in 8K and include a full, regularly updated library of digital starfields, planets, comets, moons, nebulae, etc. For the original E&S press release with the specifications, see [www.es.com/News/2013/2013-09-16.html](http://www.es.com/News/2013/2013-09-16.html).

The following interview is with Jim Peck as well as with Justin Bartel, immersive experience specialist at the museum.

**Q** You’ve made a dramatic, state-of-the-art digital transition. How did that come about?

**Jim Peck:** Our IMAX 15/70 film projector and our Digistar II were both well-worn and we saw that it was time to move forward with some new systems. We couldn’t deliver the kinds of programming we wanted to give our visitors. We had dialed back our astronomy shows to a live night sky program about once a month.

**Q** How did you re-ignite your astronomy offerings?

**JP:** We were shopping for an open kind of system, thinking of our dome as a canvas that wasn’t necessarily for any one thing. The Digistar 5 appealed to us as having that kind of versatility. Initially, we had not planned to do much astronomical content in The Dome. We had thought we would focus on pre-rendered films, and offer a live star show about once a week, but the D5 has such robust as-

tronomy features that we changed our plans and brought in Justin, as a specialist with content and technical expertise, to produce live astronomy shows.

We quickly realized that the astronomy was more popular than we'd foreseen, and that we had a great presenter who knew how to make the most of it. People wanted more.

Live presentations now follow just about every pre-rendered show that runs in The Dome. In just the first six weeks, this programming attracted a significant following, with 30-40 people sticking around to ask Justin questions after each show.

He updates the content weekly to reflect current events. As an example, when the Kepler Space Telescope recently discovered the new, Earth-like planet in the habitable zone of another star, NASA held its press conference at 2 p.m., and we had it in our show at 3 p.m. the same day. It's the perfect formula of the right system and the right talent.

**Q** How are you dividing up the schedule between giant screen movies and astronomy presentations?

**JP:** Cosmic expeditions now take up about half of the public schedule in The Dome—competing successfully with screenings of *Great White Shark*. A cosmic expedition is a 30-minute full-dome show that has space science content—such as *Wildest Weather in the Solar System*—and is followed by a 20-minute live presentation.

We have abundant walk-in traffic in addition to our school groups: family after family coming in, going into The Dome and watching shows. Our numbers are up 30%-40% over last year in general, and over the spring break period, they were double last year's.

**Q** Tell us about your marketing phraseology—calling the theater The Dome, and the astronomy shows “cosmic expeditions.”

**JP:** It's helped frame where we are now compared to where we were before the renovation—and it's selling tickets. What we are now offering is so different from what people grew up with here, and descriptive terms like “cosmic expedition” help convey that. We're doing new things and we needed new, evocative words.

We struggled with naming the theater. “The Dome” has caught on with the press and the public, and it is evocative of a special place where any number of amazing and unique things could happen. It let us distinguish ourselves in the marketplace.

Our mission is inspiration—and we find that we are now able to exceed our guests' expectations.

**Q** How does *Great White Shark* look on the new system?

**JP:** We love *Great White Shark* on the D5, and so does our audience. Attendance for this show is very good, and weekend screen-

ings are almost full. The picture is impressively bright and crisp, with great contrast. As we had hoped, the D5 has surpassed the visual impact of our IMAX projector. Any differences are improvements.

Projecting it is a streamlined operation—the auto-align and auto-blend features keep the image looking great. The full-dome digital transfer created by E&S is amazing, and it fills a larger portion of the dome than the film version could. When we repaneled the dome, we covered up the cut out for the old projection booth in the back of the theater to make the most of this.

**Q** Do you plan to run shows at high frame rates and in stereoscopic 3D?

**JP:** The D5 is capable of frame rates up to 60 fps and this high refresh rate can be applied for real time content as well as playback. The same is true for stereo 3D, which runs at 120 fps (60 fps per eye using active stereo). We

aren't using either of those for public shows yet, although we have done several demos and the quality is astounding.

We are still thinking about when and how to roll it out to the public. For now, we plan to focus on the live presentations that are proving so successful, and build from there.

**Q** Justin, how do you like working with the new system?

**Justin Bartel:** It's fast and intuitive, and a huge leap from the D3 that I worked with previously. The user interface has been redesigned, and I was able to hit the ground running with it.

In addition to high resolution and brightness, it has great flexibility and a rich library of assets that is regularly updated and easy to access. It lets you move freely from topic to topic: what you want, when you want, and easily responding to audience requests.

*(Continues on page 60)*

## Meet Justin Bartel, the immersive guy



Justin Bartel

While growing up in North Newton, Kansas, Justin Bartel made regular trips to the nearby city of Hutchinson to visit the Kansas Cosmosphere and Space Center and its Justice Planetarium. This fostered an

interest in astronomy and space exploration that eventually led him to attend the University of Arizona, with summers spent back at the Cosmosphere working with students attending their Future Astronaut Training Program summer camps.

After graduating with a bachelor's of science degree in astronomy in 2005, Justin once again returned to the Cosmosphere to assist with astronomy education programs and operate the planetarium's Spitz 512 projector.

In 2007, Justin moved to a position at Exploration Place in Wichita, Kansas, and was introduced to the digital planetarium in the form of E&S's Digistar 3. Here he joined an experienced staff and learned how to operate, maintain, and produce full-dome content in the theater where Digistar 3 had premiered to the world five years earlier.

After departing Exploration Place, Justin pursued opportunities in science education in Boulder, Colorado and Orlando, Florida before joining the Science Museum of Vir-

ginia in late 2013. In the first three months of 2014, he has assisted with the opening of a new full-dome theater at the museum's satellite campus in Danville, Virginia, and the re-opening of The Dome.

**Question:** What makes a good live presentation?

It's more than reading headlines or reciting a script—it starts with having a story to tell and then finding your reason to tell it. I'm always looking to add some interesting fact visitors may overlook on their own, or to make connections between multiple topics.

Once I'm hooked on a story it becomes a lot easier to get other people interested, and it leads more naturally to visitors getting involved in the presentation by answering my questions and asking questions of their own.

**Question:** Why are live presentations important and what makes an audience respond to them?

I think a lot of people are naturally curious about space, but because astronomy includes so many topics that are so far removed from our everyday lives, both literally and figuratively, it helps to have a live presenter to serve as a guide. The presenter also helps the audience get more out of a full-dome show by being available to answer questions that come up, and to share relevant new information.

Supplementing these productions with live presentations is a way to keep our visitors informed about the latest discoveries, and I think they really appreciate that. ☆

Vertical drop height (cm)	Diameter of crater (cm)		
	Mouse ball	Golf ball	Practice Golf ball
30			
45			
60			
75			
90			
105			
120			
135			
150			

Have one of the groups travel to the station where you have a plastic tub with salt in it. The students will film a series of impacts from different heights and record the data. (See Fig. 1.)

The jobs for the students are meteor release personnel, data recorder, and videographer. I have the students record the impact so we can watch them in frame by frame to see the craters develop. (A sample video of what a group of my 8<sup>th</sup> grade astronomy students did can be seen here: [www.youtube.com/watch?v=Vf6Kiikpl3A](http://www.youtube.com/watch?v=Vf6Kiikpl3A))

The important thing to re-

mind the students is to just let go of the ball and allow gravity to get it to the ground; we don't want them to add a significant initial velocity to the balls.

Have the students observe if there is a noticeable pattern to the crater diameters, or do they all have identical craters regardless of release height.

As each group tests their heights, they then rotate in and out of the online craters activity.

I have seen this lab done before using fine sand or flour, but I have found the clean up of the planetarium at the end of the lab to be easier with salt. ☆

DCI compliant systems or inset projectors may be desirable in order to attain ultimate versatility. Some of those shopping for new digital systems view their spaces as something like today's multipurpose performing arts centers, wanting accommodation for spoken word and traveling live shows as well as the ability to screen alternative content along with the main menu of educational shows.

Planetarium operators were present; we spoke to representatives of Tycho Brahe and of Fels Planetarium. Lisa Samford of the Jackson Hole Wildlife Film Festival attended, looking for ideas, trends, and content to showcase at the Jackson Hole New Media Symposium in Boston, September 17-19, which will use multiple venues in order to meet its goal of screening everything in its native format, Not just during the Symposium, but also for the judging of the Science Media Awards.

The GSCA technical session included a first-ever from 3ality Technica, the leading company in facilitating 3D live-action capture for motion pictures and broadcast. 3ality CEO Steve Schklair, who has a background in special venue cinema, appeared on camera himself in the premiere demonstration of a live 4K digital 3D theater broadcast.

### Upcoming events

SIGGRAPH, August 10-14, Vancouver, Canada, [www.siggraph.org](http://www.siggraph.org)

LIPS 2014, (Live Interactive Planetarium Symposium), August 13-15, Mystic, Connecticut



IPS president Thomas Kraupe talks about Jeri Panek of Evans & Sutherland at the banquet in her honor. Photo courtesy IMERSA.

USA, [lipsymposium.org/LIPS](http://lipsymposium.org/LIPS)  
 JHWWF Symposium & Science Media Awards  
 September 17-19, Boston, Massachusetts, [www.jhfestival.org/symposium.html](http://www.jhfestival.org/symposium.html)  
 GSCA 2014 conference, (Giant Screen Cinema Association), September 20-23, Ontario Science Centre, Toronto Canada, [www.giant-screencinema.com](http://www.giant-screencinema.com)  
 ASTC 2014, October 18-21, Raleigh, North Carolina USA, [www.astc.org](http://www.astc.org)  
 Fulldome UK 2014, November 7-8, National Space Center, Leicester, [www.fulldome.org.uk](http://www.fulldome.org.uk). ☆

I can share the cool stuff that audiences care about: the story of the universe, traveling across the solar system, traveling outside the galaxy, breaking news of the cosmos.

I like to do something a little different for every show, depending on current events. Someone in the audience may ask to go to a favorite planet, or have questions concerning something that wasn't covered in the canned show, and D5 allows me to do this on the fly.

To paraphrase what my boss Richard Conti (CEO and chief Wonder Officer, Science Museum of Virginia) said: "I'm hard to please and the Digistar 5 has exceeded my expectations."

**Q** What other plans do you have for making the most of The Dome's new versatility?

**JP:** We are experimenting with other content possibilities. For our clients doing corporate events, we have started to offer them a fulldome show and live content—and they're waiting in line to do it now. We are selling people on the truly unique qualities of what they can do in The Dome.

The museum has access to an enormous amount of content and that now includes the D5 library, so tie-ins with exhibits are also in our future. We opened a new gallery last summer, and will open another next summer and the summer following. The Dome renovation is part of a new, strategic master plan and a capital campaign which officially commenced in early 2012.

We are actively raising funds and to date we have raised \$38M of the \$60M goal. The success of the new theater has absolutely helped develop private and public support and momentum.

We plan to continue to offer new and innovative experiences in The Dome and the entire museum that will excite our visitors and build a loyal audience of repeat visitors. ☆

DARWIN'S MYSTERY OF MYSTERIES

# Natural Selection



**Also available in 3D**



Watch the full-length fulldome film at [www.mirage3d.eu](http://www.mirage3d.eu)



For licensing please contact Robin Sip: [rsip@mirage3d.nl](mailto:rsip@mirage3d.nl)



# International News

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At the time of editing this column, in late April, the starry sky is only seen for a few hours during clear nights at my northern Swedish latitude. Also, at least for the last few days, there have been sunny days and temperatures getting close to 20°C, unusually warm for this time of the year.

Inspired by the weather, I have invested in a new bicycle with a small electric motor in the front wheel hub so I don't have to get off the bike as soon as the road turns uphill— just to pedal on like in my younger years. I won't be able to attend this year's IPS Conference, but I wish all of you who do some nice and interesting days in Beijing.

The International News column is built on contributions from IPS Affiliate Associations. So if you have news that you want colleagues worldwide to read, please send it to your IPS representative (see page 2). Their deadlines are 1 July 2014 for *Planetarian* 3/2014 and 1 October for 4/2014, so they need your news ahead of those dates.

You who want to contribute news from parts of the world where IPS has no Affiliate Association are welcome to send it to Martin George, martingearge3@hotmail.com.

For contributions to this International News column, I sincerely thank Agnès Acker, Vadim Belov, Bart Benjamin, Ignacio Castro, Alex Delivorias, John Hare, Warik Lawrence, Ian McLennan, Loris Ramponi, Aase Roland Jacobsen, Patty Seaton, Alexander Serber, Jenny Shipway, Rachel Thompson, and Michele Wistisen. I wish you and other representatives back with news for upcoming *Planetarian* issues.

## Association of French-Speaking Planetariums

Cité de l'Espace in Toulouse aims to present to the general public and schools the latest developments in space activities. In 2014, with the support of its partners ESA (European Space Agency) and, a CNES (National Centre for Space Studies), new temporary exhibitions will open, devoted to two extraordinary space missions in the solar system: The Rosetta mission, with rendezvous with a comet nucleus, and the Mars Curiosity mission. Full-scale models of the Rosetta lander, named Philaé, and the Curiosity rover are both placed in immersive and realistic planetary panoramas,

along with panels and interactive exhibits. For more information, contact Marc Moutin, m.moutin@cite-espace.com.

La Coupole, a real underground town located 5 km from Saint-Omer, was built in 1944 by the German army. This historic site immerses its visitors in the heart of the history of World War II. Originally, this huge bunker was used to store, prepare and launch V2 rockets, the secret weapon with which Hitler planned to destroy London.

Behind this weapon is discovered the story of a young engineer, Wernher von Braun, who went on to develop, for the Americans, the immense Saturn V rocket that sent humans to the moon.

Today, it is an amazing museum, a place for understanding of the historical and scientific issues of the Second World War, from the occupation to the hidden face of the space conquest. For more information, contact Nicolas Fiolet, nfiolet@lacoupole.com.

The re-born Vaulx-en-Velin Planetarium just re-opened on 28 January in a totally new configuration. After almost 20 years, the



AFP, top: Exhibition on the complexity of the universe in the Vaulx-en-Velin Planetarium. Courtesy of Ville de Vaulx-en-Velin/Studio Gaudin-Ramet. Bottom: Full scale model of the Rosetta Lander named Philaé. Courtesy of Cité de l'Espace.



As each year in Marseille, a workshop gathers approximately 20 small digital planetarium owners, as it did in December 2013. Intended for French-speaking people using Stellarium360 or Nightshade Legacy, it attracts people from all over France, but also some Italian, Spanish, Belgian and Swiss people. For more information, contact Lionel Ruiz, lionel.ruiz@live.fr. Photo courtesy Lionel Ruiz.

steady increase of public visits led the planetarium near Lyon to a need for enlargement. Now the structure is 4000 m<sup>2</sup> (13,000 ft<sup>2</sup>) and will welcome 80,000 visitors per year. Some 900 m<sup>2</sup> (3,000 ft<sup>2</sup>) is dedicated to an exhibition on the complexity of the universe called From Big Bang to a Sand Grain, and to a bi-annual temporary exposition, currently Exploring Mars.

The public says this new museum is “precursor, innovative and different from all what they have seen before,” because of specific didactic points that were developed, with a lot of interactive high-technology processes.

A personal human link is created by researchers with many interactions with the visitor. Art and science are displayed in a complementary way in order to maximize the impact on the visitor. To learn more, contact Hélène Courtois, h.courtois@ipnl.in2p3.fr and/or Simon Meyer, smeyer@mairie-vaulxvelin.fr.

Digital planetariums using Lhoumeau Sky-System include more than 25 planetariums in France. That is why workshop sessions are organized once or twice a year to cover the needs of the users and to create emulation for content creation. The October 2013 session in Belfort was dedicated to motivated newbies.

## Association of Mexican Planetariums

The Planetarium Torreón was inaugurated on 20 February 2014 by representatives of all Coahuila State Government authorities. A 2.5 million dollar investment, the new facility has a 12-m (40-ft) dome with 90 seats and an Evans &





AMPAC, left: Planetarium Torreón with its impressive Saturn ring architecture; right: inside Planetarium Torreón, showing its Meade Max 20-inch telescope. Photos by Eduardo Hernández.

Sutherland Digistar5, 4.5 million pixels on the dome, an astronomical observatory equipped with a Meade Max 20-inch telescope and 2 Solar Max 90 telescopes with double filters, capable of live transmissions via the internet and capable of being remotely operated.

The new facility includes a temporary exhibits hall, a permanent exhibit hall from micro to macro cosmos, hands-on exhibits, two-40 m murals painted by local artists, a cafeteria, and educational services area.

This science diffusion complex has become one of Mexico's most, serving 2 million inhabitants in the metropolitan area.

The project was made possible thanks to the contributions of the Torreón Planetarium Civil Association, the Science and Technology Council, CONACYT, and the Coahuila State Government as well as the Municipality of Torreón.

In the first two days after inauguration, it received 1,500 visitors, a full house on every show! It has established an agreement with Torreón's Mayoral to receive 500 children monthly.

Eduardo Hernández is current general director of the Planetarium and also president-elect of AMPAC. The Planetario Torreón web page is [www.planetariumtorreon.com](http://www.planetariumtorreon.com).

### Australasian Planetarium Society

The Australasian Planetarium Society held its 2014 annual conference at the Melbourne Planetarium on the 17-18 February. It is always a great opportunity for all of the community to get together, discuss latest developments in the field, and find out what everyone has been up to for the last 12 months. And, as it turns out, they have all been very busy.

The annual APS Members Activity Report was produced just prior to the conference and details the incredible diversity of work that the APS community has produced, encompassing public outreach programs, special events, education programs, research into im-

mersive environments, full-dome show production and more.

In 2013, three planetariums across Australia underwent major upgrades: the Melbourne Planetarium at Scienceworks (Melbourne, Victoria); the Sir Thomas Brisbane Planetarium (Brisbane, Queensland); and Horizon, the Planetarium at Scitech (Perth, Western Australia). It is good to see that these planetariums have been able to secure funding to make them state-of-the-art facilities.

Many other planetariums within the APS have also been able to secure funding for new equipment, including new seating, telescopes, and projection equipment, as well as software upgrades. All of this is a good indicator to the economic success, vitality and relevance of planetariums within this region.

APS, right: Members inspecting the Great Melbourne Telescope restoration works. Photo by Warik Lawrance. Below: Group photo from APS 2014. Photo by Martin George.

Prior to the conference, Warik Lawrance, APS president, put out a call to the operators of portable planetariums and smaller fixed planetariums to consider joining the group. As a result, the community welcomed both the Planetarium Education Group and the UNSW Physics Outreach Unit to the APS.

The APS conference this year included two pre-conference events. One was *Natural Satellite*, a live performance in the planetarium dome by classic guitar virtuosos Leonard and Slava Grigoryan, accompanied by DigitalSky



fly-throughs of the moons of our solar system.

The second was a tour of the Museum Victoria Collection Stores to view the restoration project for the Great Melbourne Telescope. This telescope was a major astronomical achievement for the 19th century. It operated from 1869 to 1945 at Melbourne Observatory, and then was relocated to Mt. Stromlo Observatory, Canberra, where it was rebuilt to continue astronomical research.

After the devastating Canberra bush fires in 2003, the remains of the telescope were handed over to Museum Victoria and the restoration project hopes to see it returned to Melbourne Observatory for outreach and education.

This year also saw the introduction of an inaugural APS Competition. Taking inspiration from Jenny Shipway and the crazy events she runs at the conference for the British Association of Planetariums, for the competition this year all members of the APS worked in teams to create, and then present, an alien life form made out of plasticine.

While everyone was quite apprehensive about the whole idea at first, they soon become thoroughly engrossed in their creations. The competition was enormous fun and the final presentations added great hilarity to a very successful and inspiring conference.

## British Association of Planetariums

As part of a project to make astronomy more accessible to British Sign Language (BSL) users in Scotland, the Royal Observatory Edinburgh team ran successful interpreted planetarium shows for deaf audiences at BBC Stargazing Live public events in January.

A team of deaf scientists and linguists, including Dr. Audrey Cameron of the Scottish Sensory Centre and Gary Quinn of Heriot Watt University, worked with astronomers and science communicators from the Science and Technology Facilities Council at the Royal Observatory Edinburgh to develop new sign language for astronomy.

The project, funded by the Scottish Government, built on work Audrey and Gary have done with other sciences, building up a science BSL glossary. Over 90 new signs for astronomy were created, including signs for some of the key northern hemisphere constellations, some of the brightest stars, and the planets of our solar system.

Delivering a deaf-accessible planetarium show, or indeed carrying out observing sessions with telescopes, is tricky, since the activities are in the dark. However, using a red light in the planetarium to light up the interpreter worked very well, and did not affect people's dark adaption greatly. A fibre optic style projection system was used rather than digital projection and the audience was able to see



BAP: Signing in the planetarium during the Scottish Deaf event. Photos by Chris Scott.

both the interpreter and the stars very clearly.

Other things to consider when delivering this sort of show is that while the interpreter is signing the audience will be looking at him/her, so the planetarium presenter is required to adjust his/her pace accordingly, ensuring that they wait until the interpreter is finished before pointing to the object concerned.

This pilot project was an ongoing learning process, but overall the feedback from the deaf community who attended the event was extremely positive. In addition, the interpreters who were involved were very enthusiastic, not just about helping with astronomy planetarium shows, but the idea of having BSL interpreters at other events that take place in the dark.

The Centre for Life at Newcastle upon Tyne is a science center containing a 65-seat planetarium running a busy program with 111,254 visitors seeing 3,103 full shows in 2013.

As part of their brief to work with other cultural venues and to engage more difficult to reach ethnic audiences, the team at In-

ternational Centre for Life worked with the excellent but under-visited Oriental Museum at the University of Durham to bring items with astronomical significance in their nationally-recognized collections to a wider audience.

A new presenter-led planetarium show was developed and ran daily over the Easter holidays, supplemented by members of the museum staff running activity sessions outside the planetarium. Centre for Life also developed an astronomy trail for the Oriental museum.

The project encouraged more detailed study and photography of a number of objects with astronomy links, like this Mughal celestial globe from 1790 [image]. Since Islamic theoretical work was based on that of ancient Greek astronomers, you can have fun identifying many of the constellations!

The team at Centre for Life encourages others to look for creative partnerships with other local venues. They have gained lots of positive cross-learning as well as mutual benefit in sharing disparate audiences and publicity.

Finally, whilst a significant appeal of the show is its local bias, if anyone is interested in the content they are willing to freely distribute it in Digistar3 format or as script and source images. Contact Chris Hudson [christopher.hudson@life.org.uk](mailto:christopher.hudson@life.org.uk).

## Canadian Association of Science Centres

The Ontario Science Centre in Toronto, Ontario welcomed 60,000 students and visitors to their planetarium in 2013. New live public

shows include *The Extreme Universe*, targeting visitors age 8+, and a modified version of *The Sky Tonight* which includes highlights from Islamic astronomy. Three school programs, *The Night Sky*, *Solar System Revealed*, and *Cosmic Connections*, offer new content directly tied into the Sultans of Science temporary exhibition. Additional information, Sara Poirier, Sara.Poirier@osc.on.ca.

At the groundbreaking IMERSA



BAP: Celestial globe, India, 1790. Photo courtesy of Oriental Museum, University of Durham.

Summit in Denver in March, 2014, among the nearly 200 delegates were a number of Canadian contributors to the program: Jonathan Barker (SK Films), Alan Caskey (Holovis International), Brookes and Fiona Diamond (Brookes Diamond Productions), Brian Eimer (Images in Sound), Gordon Harris (Christie Digital), Ian McLennan (IPS Canadian Representative), Toby Mensforth (Consultant), Alan Nursall (TELUS World of Science-Edmonton), Domenic St-Amant and Louis-Phillippe St-Arnault (both of SAT, Society for Arts & Technology, Montreal). Additional information, Ian McLennan, [ian@ianmclennan.com](mailto:ian@ianmclennan.com).

In addition to the HR MacMillan Space Centre's line-up of pre-rendered shows in Vancouver, British Columbia, audiences were offered a combination of live presentations that allowed conversations with visitors as well as a series of special shows in the planetarium star theatre.

These productions included two sold-out Valentines shows, a tribute to music in science fiction movies during Hollywood's Oscar weekend, a lunar eclipse event, and return of a popular series presented with local historians showcasing panoramic images from Vancouver in the early 1900s. These shows included some of the best from image archives amassed by a staff photographer over 40 years of travelling the globe. Favorites included Abu Simbel and the Parthenon, as well as some of the great cathedrals of Europe, such as Sainte Chapelle and the Medici Chapel.

This northern summer they are launching *Back to the Moon for Good* as a feature presentation in the star theater. Associated programming will include public talks by Plan B, a local team competing for the Google Lunar X Prize. Additional information, Lisa McIntosh, [lmcintosh@spacecentre.ca](mailto:lmcintosh@spacecentre.ca).

### European/Mediterranean Planetarium Association

The Eugenides Planetarium, in an early celebration of the vernal equinox, premiered on 18 March the show titled *GAIA: Bridge to a Billion Suns*. The show, an ESA production about the Gaia space mission to chart a 3D map of the Milky Way, was introduced to a total audience of more than 800 persons (in three showings) by Jos de Bruijne, deputy project scientist of the GAIA mission, and Professor Mary Kontizas, Greek GAIA team leader and vice president of the European Astronomical Society.

The Eugenides Planetarium, in collaboration with Ellinogermainiki Agogi, a local pri-

vate primary and secondary school, brought to Greece (12 April-31 May) CERN's interactive exhibition titled *Accelerating Science*, a fascinating tour-de-force to the beginning of the universe and the heart of matter!

The aim of this celebrated exhibition is to inspire a sense of curiosity and wonder about the origin of the universe and the fundamental building blocks of matter by showing how the experiments at the Large Hadron Collider will unravel some of the deepest mysteries of the universe, and displaying the connection between fundamental research in the past with technologies of the present. The Eugenides Planetarium could not have hosted this exhibition without the invaluable help and support of the School of Applied Mathematics

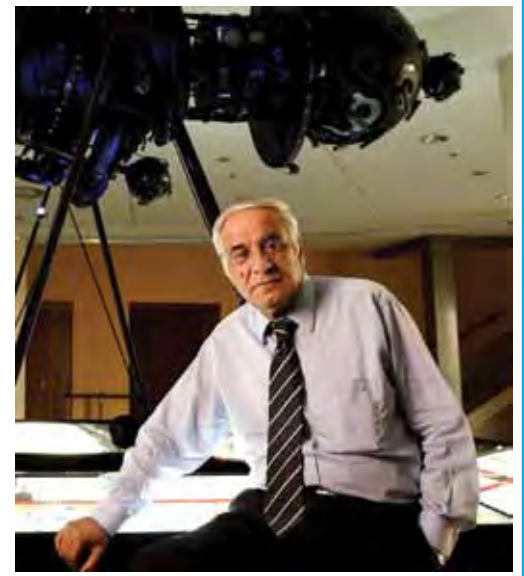
### Dionysios Simopoulos retires

After exactly 41 years from the date of his return to Greece, Dionysios "Dennis" Simopoulos officially retired as the director of the Eugenides Planetarium in Athens, remaining as director emeritus and adviser to the planetarium.

His position has been assumed by Dr. Manos Kitsonas, the planetarium's technical director.

Before coming to Greece, Simopoulos was the planetarium director of the Arts and Science Center Planetarium at the Old Governor's Mansion in Baton Rouge, Louisiana (1967-1973). Simopoulos has been instrumental in helping shape IPS' truly international dimension by co-founding EMPA in 1978, the first non-American IPS affiliation.

For his work within IPS and his numerous contributions to the planetarium community, he was honored by IPS with the IPS Service award in 1996. ☆



and Physical Sciences of the National Technical University and the Department of Nuclear and Particle Physics of the National and Kapodistrian University of Athens.

It is worth mentioning that the ambassadors in Greece of CERN's member-states enjoyed a private guided tour of the exhibition on 29 April. The same was also true for the ESA delegates participating in the Copernicus-Sentinels Serving Society and the Environment Conference, also held at the Eugenides Foundation on 12-13 May and organized by the Greek Presidency of the Council of the European Union, the European Space Agency and the European Commission.

The exhibition enjoyed heavy coverage in the various mass media and several Greek physicists working at CERN gave interviews on the importance of the fundamental research being carried out at CERN.

On 23 June, the Eugenides Planetarium celebrated the summer solstice with the premiere of Google's Lunar XPRIZE full-dome planetarium show titled *Back to the Moon for Good*. The

NSC-produced show describes the competition between teams around the world to land a robotic spacecraft on the moon for the first time in more than 40 years.

Further north, in Croatia, the Astronomical Centre Rijeka celebrated on 2 April its fifth anniversary with the inauguration of a travelling exhibition of photographs on canvas that highlight its main activities so far, an event complemented with live jazz music. Also in April, the center introduced in its regular program two special shows related to Yuri's Night (12 April) and Earth Day (22 April) and organized a science festival whose main theme was waves. It featured *Kaluoka'hina-The Enchanted Reef* for its younger audiences, as well as the 10-minute live presentation

*Ocean Movements: Waves and Tides*.

An interesting aspect of this festival was Emil Vargovic's exhibition *Fractals: Reflection of Comprehensiveness*, a display of approximately 30 pieces on cosmology and the universe.

The same month saw Academic Astronomical Society Rijeka holding a series of astronomy lectures, whose participants had also the opportunity to view various celestial objects through the main telescope.

On 22-24 April, the center, in collaboration with the Croatian Association CEZAR, which promotes energy efficiency, organized the International Dark Sky Week, which included lectures on light pollution as well as a presentation of the steps taken by the City of Rijeka to reduce its negative effect to the observation of the night sky.

As part of the mid-term school holidays, Astronomical Centre Rijeka presented *Encounter With Astronomy*, a live show for school children, in which educators in the digital planetarium acquainted visitors with the night sky,



EMPA: During the premiere of the show *Back to the Moon for Good*, Team Stellar presented their own lunar rover model, as well as their educational project Stellar Balloon–Stratosphere. Photo courtesy of Rijeka Sport Ltd.

the constellations and their brightest stars, nebulae and galaxies, etc. During Astronomy Week, the center featured the new show *Back to the Moon for Good*.

On this occasion, the international non-profit association Stellar Team presented its own contribution to the Google LunarX Prize project, which involves the construction of a moon rover. Stellar Team also presented Stellar Balloon–Stratosphere, an educational project where 22 teams of Croatian high school children designed and conducted experiments by launching balloons at a high altitude and subsequently analyzing the data collected.

In June, Astronomical Centre Rijeka participated in the celebrations of International Ocean Day with films about the ocean as well as interactive presentations on the summer solstice and conjunctions of Mars and the moon. It also produced *The Little Universe*, a planetarium show suitable for children, on the earth, the solar system, the different constellations, and the Milky Way.

## Great Lakes Planetarium Association

**Illinois.** Sheldon Schafer, Peoria's long-standing planetarium director, has retired. Sheldon started work at the Lakeview Museum Planetarium in April of 1976 and ended fulltime work at the Peoria Riverfront Museum on 28 January. Peoria's Community Solar System Model officially re-opened on 8 February. The scale factor is 99,000,000:1, spread across 6,000 square miles of Central Illinois. Peoria's annual Interplanetary 5K race occurred on 22 March.

The William M. Staerkel Planetarium at Parkland College in Champaign opened the season with their live *Spring Prairie Skies* program, plus their full-dome rendition of two other shows. Girl Scout sky badge workshops and Boy Scout astronomy merit badge sessions were held in April and May, respectively. Recently, the staff wished Carolyn Martin a happy retirement from the planetarium office and welcomed Cindy Reynolds as their new operations person.

This spring, the Cernan Earth & Space Center at Triton College presented its own program *The Moon: From Imagination to Exploration*, as well as its own mini show about the current apparition of Mars, appropriately titled *Mars 2014*.

**Indiana.** Dayle Brown, one of "Indiana's own," began her term as GLPA president-elect on the vernal equinox. Dayle is working her way through stories for the next book in her *Skylore from Planet Earth* series. Dayle has a website, [www.pegasusproductions.net](http://www.pegasusproductions.net), which offers resources to planetariums.

Ball State University in Muncie is currently in the construction process of its new planetarium. This facility will be the host site for the 2014 GLPA conference.

After more than 55 years of service to the Evansville community, the Koch Planetarium at the Evansville Museum presented its final show on 2 February.

On 7 February, the museum opened the doors to its new Koch Immersive Theater and enjoyed a three-day weekend of sell-out crowds following the ceremonial cutting of a red ribbon by local dignitaries and school children. The new planetarium's 12-m (40-

ft), 15-degree tilted dome theater uses Evans & Sutherland Digistar and two JVC projectors, with theater technology designed and installed by Bowen Technovation.

Bowen Technovation in Indianapolis has completed the first planetarium in Jordan at the Princess Haya Cultural Centre in Amman.

The Edwin Clark Schouweiler Memorial Planetarium at the University of Saint Francis in Fort Wayne opened its WinterFest 2014 on Valentine's Day with a sell-out of its evening *Dessert Cruise to the Planets*. In addition to Schouweiler's production of SEPA's *The Planets*, the event featured Valentine beverages and bon bons before the planetarium show and a dessert break afterwards.

**Michigan.** With the coming of spring, the major renovation of the Chaffee Planetarium at the Grand Rapids Public Museum is complete. Their Digistar 5 projection system is augmented with an updated sound system, LED dome lighting, and refurbished seats under its 50-ft dome. Initial audience experiences in the renovated facility included an opening trailer explaining the life and death of Roger Chaffee and a brief exploration of the current night sky.

The Kalamazoo Valley Museum Planetarium conducted special programs on viewing and photographing the total lunar eclipse of 14-15 April and mapping the moon.

Following a successful Winter 2013 series by Cliff Jones, Southfield's Vollbrecht Planetarium presented its spring 2014 lecture series of eight 90-minute Wednesday evening programs by Mike Best. Each of the illustrated lectures offered a 20-minute star show, a question-and-answer session, handouts, and door prizes.

The University of Michigan's Museum of Natural History Planetarium is distributing a free, NSF-funded, 7-minute *Dark Matter* full-dome clip from the research of Dr. Kathryn Zurek. The staff is also producing a series of four short clips to update current opinions about black holes. Contact Matthew Linke at [mmlinke@umich.edu](mailto:mmlinke@umich.edu) for details.

**Ohio.** The Vandalia Planetarium's November show *Asteroids, Comets, and Meteors, Oh My!* was packed with more than 100 people! With only 66 permanent seats, patrons were literally hanging in the doorway and watching from the hall. The year 2013 ended with December's *A Scope for Christmas* show, which gave away a Galileoscope to one lucky little visitor.

Dayton's Boonshoft Museum of Discovery reports that Scott Lever, mission manager of NASA's MER Mission, presented the recent successes and challenges encountered by Opportunity on the 10th anniversary of its 24 January 2004 landing on Mars. The travelling exhibition Amazon Voyage was featured at Boonshoft through 27 April. The planetarium

show accompanying the exhibit featured legends of the Amazon, dark skies of the region, and demonstrated to visitors why the sky appears different from a southern hemisphere location.

The BGSU Planetarium tried an experiment by running its annual Christmas show *Secret of the Star* on both Christmas Eve and for the first time on Christmas Day, and visitors expressed their appreciation for the expanded holiday schedule. In its lead-up to installation of Spitz SciDome, BGSU is doing encore runs of most of its shows from the past thirty years.

**Wisconsin/Minnesota.** After 37 years of assisting students and visitors to see darkness in a whole new light, Larry Mascotti of the Mayo High School Planetarium in Rochester, Minnesota will be seeking new horizons to explore in his retirement at the end of the school year.

The staff is happy to report that there is a renewed effort underway to secure bonding for a new Bell Museum and Planetarium. In the fall of 2013, the Bell Museum completed the pre-design for a new facility located on the St. Paul Campus of the University of Minnesota.

The Daniel M. Soref Planetarium in Milwaukee presented *Astronaut* from the National Space Center in England to complement its *Body Worlds* exhibit. *Romancing the Stars*, a live Valentine's show, played for the seventh straight year.

At the UW-M's Manfred Olson Planetarium, director Jean Creighton is thrilled to be one of the 24 people chosen by NASA to be an Airborne Astronomy Ambassador and fly on SOFIA at 45,000 feet to collect infrared data. Jean hopes to share this experience at the next GLPA conference.

### Italian Association of Planetaria

"To tell to the stars" is a new contest organized by the Italian Association of Planetaria. The contest rules encourages applicants to write a story that will be told under a planetarium dome. In fact, the author of the text also is invited to read out the story and record it as mp3 file.

The winners of the first issue of the contest are Simona Romaniello, Emanuele Balboni, Marco Brusa and Eleonora Monge, operators from Infini.to Planetarium, Turin. The prize committee selected this work for its high technical and content levels, and also for its use of language.

The text, inspired from Palomar by Italo



GLPA, top: The outside of the 2½ story, glass-walled Eykamp Pavilion, which serves as a new entrance on the south side of the Evansville Museum of Arts, History & Science. Right: The inside of the new 40-ft Koch Immersive Theater. Photos courtesy of Mitch Luman.



Calvino, describes the basic knowledge about astronomy and includes detailed descriptions of the planetarium projection. The high quality of the sound allows the possibility of the use of this product with the general public, as requested by the contest rules.

To improve the participation of small facilities and young planetarians during the annual meeting of Italian planetariums, PlanIt is supporting another prize called "Tell your experience" designed to improve communication presented during the national conference.

The prize committee selected Matteo Montemaggi from San Mauro Pascoli, who presented the PowerPoint "To bring astronomy in the schools." The presentation describes some teaching activities organized by single operators, sometimes also in collaboration with local amateur astronomy associations, inside and outside planetariums. Montemaggi is a teacher, therefore his attention is devoted mainly to school lessons through practical astronomical activities that involve the attention and the curiosity of the students.

All these are the aspects that the prize would like to support.

Another prize is devoted to a video about any astronomical and astrophysical subject and will be described in the next column. Copies of the winning product will be shared with PlanIt members.

StarLight, Perugia, a hand-held planetarium, is continuing to diversify and improve its activities in schools of all levels. Just one example of this is the special workshop planned for a partially-sighted boy during a lesson for primary school students.

There were three different steps to the activity, which he carried out with the help of his special needs teacher. First, the boy made a drawing by freely connecting large black dots on a sheet of paper, and then gave his work a title. Then, to discover which constellation he had drawn, he compared his drawing by touching the figure projected on a large screen using the Stellarium program.

In the second step the boy used a piece of string to connect some paper clips fixed onto two different sheets of paper, thus outlining two constellations, according to his own imagination. Then he compared his constructions with two others which we had made, us-



IAP: Copper relief map of the northern sky; dots and lines indicate the constellations, and the circular line outlines the circumpolar stars. Photo by Simonetta Ercoli, courtesy of Star-Light.

ing the convectional drawings. In this way he could understand that there are different ways to represent the same stars in the sky but only one is the conventional one accepted worldwide.

The final activity was the use of a copper relief map of the northern circumpolar celestial hemisphere. The student had to touch the map, focus on some constellations, draw them on a sheet of paper and then write their names. He perceived the rotation of the Earth, moving the map anticlockwise, and he also understood the circumpolar stars, because a circular line outlined them.

### Middle Atlantic Planetarium Society

Education is an important mission of the planetarium. In MAPS' position statement is clearly laid out the value of the planetarium's role in education:

The study of Earth and space systems, included in national and state science standards, is dynamically explored in planetariums.

The planetarium serves as a laboratory in which students reinforce and confirm related concepts introduced in the classroom. Additionally, they deconstruct misconceptions and discover new perspectives.

Student comprehension of complex concepts is enhanced by the ability of the planetarium to compress long term patterns and cycles into shorter segments which result in powerful learning experiences.

(The complete position statement can be found online at [www.mapsplanetarium.org/about](http://www.mapsplanetarium.org/about).)

Last year, in support of this important mission, MAPS developed an Education Research Grant to financially support its members in conducting research on the use and impact of planetariums in education. The grant award is up to \$2,500, with the agreement that the grant recipient will disseminate his/her research findings in a paper or poster presentation at the next MAPS conference within one year of completing the research project and

submitting his/her research findings in the regional journal, on the MAPS website, and in possible future reprints.

An immediate grant application came from Kim Small of the Upper Dublin School District Planetarium in the suburbs of Philadelphia, Pennsylvania. Not only has she served on the executive committee of MAPS, she has also presented valuable research that she has done in the past.

Her proposal was reviewed and subsequently accepted by a MAPS Education Research Grant panel made up of at least three reviewers consisting of one MAPS Board Member and two other Education Research Grant reviewers.

The goal of Kim Small's research project was to analyze how early elementary-aged children increase their understanding of observational astronomy concepts, in particular focusing on the moon, from interventions in the classroom and the planetarium. The design included a classroom pre-visit by Kim, where topics that will be presented in the planetarium are introduced and student misconceptions are identified.

After the planetarium visit, which always includes some live content, Kim planned to return to the classrooms for a post-visit lesson, which usually serves as an assessment. Using this pre-visit, planetarium lesson, and post-visit design, student gains in content knowledge and understanding of scientific practices were to be measured.

Her proposed research planned to expand upon a previous research study conducted in April 2012 with Dr. Julia Plummer of Pennsylvania State University.

Kim presented her findings in a poster session at the MAPS conference in July 2013. The data she has collected are invaluable to plane-

tarium educators who find they must justify their work to their superiors who need data. Her research is proof that the work under the dome serves the very purpose in education that is set out to accomplish.

This type of research should be encouraged and expanded; MAPS continues to offer this grant opportunity to any MAPS member. The grant year opens annually on 1 January with rolling submissions until funds are exhausted or the year ends. Look for Small's findings to be published soon on the MAPS website. Other regions are encouraged to support planetarium education research as well!

### Nordic Planetarium Association

Urban Eriksson from the Planetarium at Kristianstad University, Sweden, has been very busy writing his thesis on astronomy education research on student's difficulties with 3D awareness of the universe and how simulations can help.

He has had some 500 visitors last year, and plans to expand next year when he has finished his thesis, if he gets the necessary funding.

At the Museum of History of Science and Technology, University of Latvia, Riga, director Ilgonis Vilks and his team started up a new project, which they call a mini-planetarium. They demonstrate the night sky using Stellarium software on a big (3.5x6-m) flat screen in full HD resolution. The live shows lasts for one hour and includes some videos from ESO, NASA, etc. Regular shows take place once per week and hold 80 seats, but the average number of visitors is about 40. See also [www.lu.lv/par/strukt/muzejs/planetarijs](http://www.lu.lv/par/strukt/muzejs/planetarijs).

Anna S. Arnadottir from Vattenhallen Science Center at Lund's University, Sweden, re-

*(Continues on page 70)*

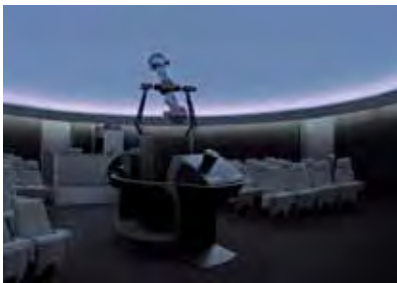


NPA: Ilgonis Vilks and the mini planetarium in Riga, Latvia. Courtesy of University of Latvia.

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We make it visible.

(International, continued from page 68)

ports of increasing attendance to the planetarium since they opened in May 2010. In 2013 they developed four university-level live shows given at their courses and two shows intended for the public, *Vintergatans alla planeter* (All the Planets of the Milky Way) and *Vårt Solsystem Bland Stjärnorna* (Our Solar System Among the Stars).

At Stjernekammeret, Bellahøj Skole in Copenhagen, Denmark, the year 2013 was a fine year, with a morning 90-minute astronomy lesson almost all school day. Their new digital Starlab Projector is proving to be very popular.

Carsten Skovgaard Andersen teaches schoolchildren how to assemble a Galileo scope, and some classes borrowed the Galileo scopes and used them at home in the evenings. They were guided at the site [www.bornafgalileo.dk](http://www.bornafgalileo.dk). Here they find a new guide every month of objects to watch in the Galileo scope, and lots of other activities.

In the daytime they showed sunspots with their Sunspotter. More than 3,500 visited Stjernekammeret last year and they also had a few evening sessions.

Unfortunately, Viltė Girdzijauskaitė has experienced a decrease in attendance at the VU-TFAI Planetarium, Vilnius University, Lithuania, but they have prepared some new lectures on subjects such as astrobiology and new programs for their younger audiences. The planetarium is about to undertake a major renovation in 2015.

For the last couple of years there has been an increase in attendance at the Steno Museum Planetarium, University of Aarhus in Denmark. Especially it is worth noticing is that now more than half of the schoolchildren that visit the museum also go to the planetarium. The majority of programs in the planetarium are now live presentations and there has also been an increase in attendance to the daily programs.

Since 1995, something special takes place at the Steno Museum Planetarium every time it is full moon. Ole J. Knudsen and Aase Roland Jacobsen has implemented a variety of evening sessions with theater, poetry, art and music shows and, of course, astronomical themes such as the starry night sky, solar eclipse and shooting stars.

Last year a new aspect was added to the concept: a “full moon all-you-can-eat buffet.” The evening starts with a buffet at the Mathematics Canteen in the university building next door, and at 8 p.m. there are a lecture in museum hall, such as about the Mars Curiosity mission.

After the lecture, everybody goes to the planetarium to experience some of the issues from the lecture and get stories about the night sky.



RMPA, left: Anne Kattner models for the human sundial in Casper. Photo by Michele Wistisen. Below: The Casper Planetarium staff poses for Sun-Earth Day celebration. Photo by Heather Malody.

## Rocky Mountain Planetarium Association

The Casper Planetarium in Casper, Wyoming offered free admission to the public for the Sun-Earth day celebration on March 22, 2014. Guests were able to participate in several hands-on activities, such as making a simple sundial, sun prints, and a solar bead bracelet.

The staff of the planetarium also created a human sundial and scaled down the solar system to fit on their property. The program *Solar Quest* was offered every 15 minutes. Everyone who attended expressed their appreciation for the event. The only drawback for the day was that it snowed, so they weren't able to set up the telescopes to view the sun.

## Russian Planetariums Association

**Kazan.** Planetarium of Kazan Federal University was opened to the public in June, 2013. It is equipped with Megastar II opto-mechanical star projector under 10-degree tilted dome of 15-m (50-ft.) in diameter. The facility has 83 seats with adjustable reclining chairs, a stage and a translator room, and is equipped with the SCISS AB Uniview Universe Emulator.

A 50-cm astrograph for observing deep-space objects is mounted in a separate dome. The mount carries four telescopes, each with different specialization, such as planetary refractor and two solar telescopes. All the instruments are equipped with light-receiving devices.

**Moscow.** An interactive exhibition on cosmonautics and cosmonauts has opened at the Planetarium of Moscow. Visitors can truly experience the legendary profession, in particular, be rotated in a centrifuge, start a spaceflight, look at the Earth through a spacecraft window, eat space meals, and enter the



SOYUZ descent capsule.

New titles appeared in the planetarium schedule in the last year, with *The most interesting about meteorites* becoming one of the most popular. Exhibitions of astrophotography, the 90th anniversary of the first planetarium device, and astronomy-studio activity have been demonstrated to public. Lectures within the framework of the Scientist's Tribune cycle have been successfully held, and Science Theater for the youngest visitors began.

On 25 December 2013, Vice-Chair of the Scientific Council Anatoly Cherepashchuk, Scientific Director Faina Rubleva, Executive Director Nataly Artyukhina, and the prominent lecturer Stanislav Shirokov (postmortem) were awarded the Prize by the Government of the Russian Federation for the development of innovative educational center Planetarium of Moscow.

The XXXVIII Academic Workshop on Cosmonautics was held at the Bauman State Technical University on 28-31 January. This meeting was attended by staff members of Bryansk and Nizhny Novgorod Planetariums. The talk “Wrench of the History of Cosmonautics and Its Motherland: ROSCOSMOS Must Cooperate with Producers of Full-dome Shows for Planetariums” was delivered by Vadim Belov. He criticized a full-dome space flight program de-

(Continues on page 72)



# IMMERSE + ENGAGE



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## LIFE

A COSMIC STORY

## FRAGILE PLANET

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THE INTERNATIONAL  
SCIENCE & ENGINEERING  
VISUALIZATION CHALLENGE



CALIFORNIA  
ACADEMY OF  
SCIENCES



RPA: The planetarium of Kazan Federal University on 22 June 2013, on eve of its opening. Photo by Almaz Galeev.

*(International, continued from page 70)*

livered to the market in 2007.

During 24-28 February 2014, up to about 50 planetarians have attended the annual Lecturer Workshop held at the Planetarium of the Cultural Center of the Russian Army.

“What is the Big Bang” by Professor Anatoly Zasov from Stenberg Astronomical Institute of the Moscow State University was accompanied by a full-dome presentation and greatly impressed the audience. Attendees celebrated the 20th anniversary of the Russian Planetarium Association.

**Nizhny Novgorod.** “Сотрудники группы”—outer-space activities of the Rocket and Space Corporation ENERGIYA—visited Nizhny Novgorod Planetarium for the first time on 21 December 2013. They meet schoolchildren, answered their questions, and told about pre-flight training of cosmonauts, tools and electric jackets used in outer space, and space walks with Olympic fire and their underwater training.

A lot of children and their parents visited Nizhny Novgorod Planetarium on 9 March

2014 on the occasion of the 80th anniversary of Yuri Gagarin. The visitors enjoyed flights of plane models, balloons, and group dances.

Extramural Astronomical Olympiad dedicated to 100th anniversary of the prominent Soviet astrophysicist Yakov Zeldovich was launched at Nizhny Novgorod Planetarium on 1 February 2014. It is aimed at school-age participants.

**Novosibirsk** Planetarium emailed the first announcement of the International Multi-Dome Science and Art Festival to be held 26-29 September 2014 in Novosibirsk. A feature of this event is using a few modular-construction domes at different districts of Novosibirsk to demonstrate the full-dome media submissions to the festival. The submission deadlines for festival are: work submission, 10 August 2014 and festival visitor registration, 10 September 2014.

### Southwestern Association of Planetariums

The Planetarium at the University of Texas at Arlington is proud to host Western Alliance Conference (WAC) 2014 from 22-25 July.

The 18-m (60-ft) dome and Digistar 5 DLP System make the planetarium a one-of-a-kind teaching, learning, and special occasion space, and one of the largest, most sophisticated planetariums in Texas. Comfortable reclining chairs seat nearly 150 and the theater is wheelchair friendly.

The planetarium is in a cutting-edge chemistry and physics research facility, which includes an atrium, executive conference room, research laboratories, and Tier-2 computing facility being developed in collaboration with the ATLAS experiment being conducted at CERN.

In 1975, Professor Ulrich Herrmann proposed a quirky, round building become a planetarium. In 1981, the Roundhouse Planetarium opened with a Spitz starball, and in 2006, upgraded to Digistar 3 to match the larger planetarium in the Chemistry Physics Building. Now housing a single-projector Digistar 5 system, the 9-m (30-ft) Roundhouse Planetarium is used for astronomy Labs.

Arlington, located between Dallas and Fort Worth, is near many cultural and entertainment attractions. WAC includes a trip to Perot Museum of Science and Nature in Dallas. A post-conference tour to Fort Worth Museum of Science and History and Fort Worth Stockyards is being arranged.

WAC is a great opportunity for learning, professional development and networking. More information at [www.wacdomes.org](http://www.wacdomes.org).

Congratulations to John Cotton for an accomplished, 48-year career in the planetarium at Fair Park in Dallas, Texas! Cotton began at Fair Park in 1964. Ted Gangle, planetarium manager, recruited Cotton, whose background is electrical engineering and amateur astronomy, as part-time lecturer. Cotton soon performed scripted and unscripted shows, wrote scripts, designed visuals, and built components for shows featuring a Spitz A-1.

Cotton met Donna Pierce, now director at Pierce Planetarium, while she served as youth activities docent as a new member of the Junior League of Dallas. Cotton trained her as a planetarium lecturer. Donna says “John be-

*(Continues on page 74)*



### Southeastern Planetarium Association

It's not too late to make plans to attend the 2014 SEPA conference, to be held in Sanford, Florida, just a short drive north of Orlando. The conference theme is “To wish upon a star,” which is intended to reflect the proximity of the facility to Disney World and the huge concentration of theme parks in the area.

The host facility is the newly-dedicated Buehler Perpetual Trust Planetarium on the campus of Seminole State College. Dates are 15-19 July. The conference hosts have created a 14-minute YouTube video that includes a wealth of information regarding the conference; see it at [youtu.be/jrMA6hAdw-bl](http://youtu.be/jrMA6hAdw-bl). Further information regarding SEPA can be found at [sepadomes.org](http://sepadomes.org). ☆

SEPA: Buehler Planetarium Assistant Director Michael McConville (left) and Director Derek Demeter show that the planetarium is ready for the 2014 SEPA conference. Photo courtesy Buehler Planetarium.

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SWAP: The Planetarium at University of Texas at Arlington, host of the 2014 Western Alliance Conference, 22-25 July, 2014. Courtesy of Amy Barraclough.

(*International, continued from page 72*)

came my mentor, friend, and ‘local’ brother (my real brother resides in Massachusetts). Today I’m [a] planetarium director and John is the one who is always on call for equipment installation and or repairs; updates on latest astronomy facts, but more so in being a true friend.” Both serve on McDonald Observatory’s Board of Visitors today.

In 1966, the planetarium remodeled based on Cotton’s designs, including compass points, a tape system and microphone, slide projectors, expanded projectors, lighting, and a signal to the front desk used through 2012. “One of the things that certainly impressed me is that he was a dedicated amateur astronomer—sharing the sciences with everyone—especially the young people to whom he introduced the wonder of the universe,” said Don Garland.

In 1970, Cotton attended the Conference of American Planetarium Educators at Abrams Planetarium (Michigan). This meeting formed the International Society of Planetarium Educations which later became IPS.

When Ted Gangl retired, Cotton oversaw staff—each was regularly employed elsewhere, but dedicated time and energy teaching. The planetarium underwent a complete remodel in 1970. Cotton designed seating, console, and control systems relying on engineering expertise, and also built the console and wiring system. Spitz supplied and installed new seats and a new dome.

In 1972 John Cotton and Dodson Carmichael, director of the Health and Science Museum, replaced the A-1 with a Minolta MS-8 with grants from Junior League, Fikes Foundation, and B.C. Jefferson Fund. A later grant from Junior League purchased a zoom projector, panorama system, and Conic projection orrery. During this time period, Cotton served IPS as Publications Committee chair (1976-1980).

As many planetarians might attest, running a planetarium is no small feat. In Cotton’s words, “Building, operating, and maintaining

a planetarium, as well as creating and producing original programming, [is] challenging. I like challenges, so it was a stimulating environment.” The MS-8 began a new era for the planetarium; over the next dozen years, tens of thousands of visitors per year visited the dome.

In 1981 the Dallas Health and Science Museum name became The Science Place. Cotton continued to introduce people to astronomy and, in 1985, began graduate school at Southern Methodist University (SMU). Bow Walker became manager. In 1986 Cotton was named an IPS Fellow in the first group of Fellows. Cotton, though busy with school, continued as consultant to Bow and others.

After school, Cotton managed the planetarium again—serving as interim between Jim Greenhouse and Wilgus Burton. In 1993 Cotton returned to teaching astronomy at SMU, remaining at the planetarium part-time. He aided the planetarium in a transition from Wilgus Burton to Chaz Hafey in 1997.

Cotton and Hafey created several inventions when introducing interactive programming to Dallas. Featured in a 1999 *Planetarian* article, “Interactive Programs at the Science Place Planetarium,” they used the Lap Light System, flashlight pointers, moon phase globes, and star charts that allowed audiences to teach themselves about the sky. Cotton and Hafey received a patent (6,199,999 in 2001) on behalf of the museum for “Lap Lights.” Cotton experimented with multipart play shows instead of traditional narration, experiencing success with this type of script.

The planetarium’s capabilities expanded significantly through additional upgrades. Fifteen constellation outline projectors were mounted to

the MS-8 which, until the Goto Chronos, was more than any other planetarium of this size.

In 2005, the planetarium remodeled to an Evans & Sutherland Digistar 3. After being closed over the summer, the planetarium re-opened in the fall for the Texas State Fair. Cotton helped with the remodel and his background in computer science was helpful moving from previous production to Digistar scripting.

In 2006, The Science Place merged with the Museum of Nature and Science, becoming the Dallas Museum of Nature and Science. Paul Vinson, director of Exhibits and Theaters, oversaw staffing, scheduling, and budgeting. Cotton served as technical supervisor until 2010. He taught astronomy and scientific method classes at SMU.

In 2012, the Dallas Museum of Nature and Science rebuilt the museum in downtown, becoming the Perot Museum of Nature and Science. The planetarium was replaced by a fleet of portable Digitalis systems. Cotton documented the 59-year history of the planetarium and helped distribute equipment to planetariums in Texas and Louisiana during asset disposition.

Cotton retired from the planetarium in 2013 after the fixed dome closed (21 October 2012), but continues to share his passion for astronomy teaching at SMU. ☆



SWAP, Top: From left: Donna Pierce, John Cotton, and Carol Jordan. Courtesy of John Cotton. Bottom: John Cotton and Carol, his wife, at McDonald Observatory, Summer 2013. Courtesy of Donna Pierce.

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# Mobile News

**Susan Reynolds Button**  
**Quarks to Clusters**  
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sbuttonq2c@twcny.rr.com, sbuttonq2c@att.net  
quarkstoclusters.wordpress.com

As mentioned in the March column, most IPS Affiliate Organizations have assigned a contact person for mobile planetariums for their region. After emailing these colleagues, happily, news is starting to arrive in my email box. Thank you to those colleagues who responded so promptly. Below is some interesting information received about the activities of mobile planetariums.

## Great Lakes Planetarium Association

The Starlab/GOTO planetarium Dayle Brown sold back in 2007 has had a very active life since then. Dayle explained, "It was sold to Lou Sandock, who used it to teach astronomy to students in his Astro Camp ([www.astrocamp.us](http://www.astrocamp.us)), which is held every year at Camp

Eberhart in South Bend, Indiana." ([www.campeberhart.org](http://www.campeberhart.org))

Dayle participated in the first year of Astro Camp in 2001. The students are instructed in telescope use and have overnight camping on the "island," which houses an observatory.

"Lou has since retired and the planetarium now rests in Chuck Bueter's basement. Chuck now is in charge of Astro Camp and the planetarium is available for use by the Michiana Astronomical Society ([www.michiana-astro.org](http://www.michiana-astro.org)) when not being used at Astro Camp.

"Chuck is the president of the astronomy group as well as very well known in the planetarium community. It couldn't be in better hands!"

Dayle is certainly correct! A blog from Chuck Bueter explains just one way in which the planetarium is still being used for great educational and fun events:

Chuck writes, "After a long winter in the midwest, a unique celebration welcomed the vernal equinox with spring stars, astronomy activities, and lush tropical plants. The South Bend Adventure Club hosted a 'Tropical Overnighter' in the greenhouse at the Potawatomi Conservatories, where the fragrance of fruit plants and abundant greenery contrasted with the grays of winter. The winter constellations segued into spring under a portable planetarium, with Polaris anchoring the north as we spun through time."

You might want to consider hosting a similar event. If so, go to [www.nightwise.org/blog/welcome-spring](http://www.nightwise.org/blog/welcome-spring) for some wonderful hints.

## Japan Planetarium Association (JPA)

Meguru Kamiya's report: "Thank you for your inquiries on the mobile planetarium. We, Tenmado Kobo

Co., Ltd., are handling the whole fields of astronomical instruments and facilities."

Meguru stated that in the past there were many small analog planetariums distributed by GOTO, but in the last few years a new trend has started, as more frequently a lecturer is sent out with a digital mobile planetarium.

According to Meguru, this is a practice that was started by Naoto Kimura several years ago; he uses a Tenmado Kobo Co. digital mobile planetarium. He mainly does presentations for kindergardens and primary schools. However, the number of schools using this system is increasing each year.

Meguru explains, "In addition department stores, shopping malls, cultural centers and science centers use this system for their events. The mobile planetarium is very much accepted by the children and students because the lecturer and they are very close and it is easy to communicate, which is very difficult in the medium and big planetarium.

"For the school teachers, it is very convenient because it is not necessary for them to take their students to planetarium. We believe that the mobile planetarium will be getting more popular in Japan."

For more information: [www.mobile-planetarium.com](http://www.mobile-planetarium.com).

## Middle Atlantic Planetarium Society

As mobile dome contact person for this group, I recently asked Keith Johnson, membership committee chairman, to send me his list of all portables that he is aware of in our region. He sent a list with 134 entries, but he could not guarantee that they are all active. I will attempt to verify those that are currently active.

Here is a report about a few of them that are active in New York State.

There are 37 Boards of Cooperative Educational Services (BOCES) established across New York State. Several school districts in each BOCES join together to fund services and programs and the government of the State of New York also assists with funding (with the most assistance going to the poorer school districts in the region). The BOCES exist to help school districts and communities:

- by providing shared services that will increase student performance,
- by providing economic solutions for school districts, and ultimately,
- by creating a positive impact on the people and communities of each County.

For more information about BOCES: [www.boces.org/wps/portal/BOCESofNYS](http://www.boces.org/wps/portal/BOCESofNYS)

Currently 15 of these BOCES have an active planetarium program. Some others cross contract with those that have them or they may use a local stationary planetarium or a teacher center's portable planetarium.



An adventure in the tropics (top) with winter coats as Chuck Bueter sets up the dome; (bottom) the final setting for stars, planets and plants! Photos provided by Chuck Bueter.

A news article was recently received about a Starlab that was borrowed by the Roscoe Central School from the Sullivan County BOCES. The article indicated that all of the students in the school experienced and enjoyed the planetarium. Some classes compared and contrasted the myths and legends from various cultures and also had a discussion during which they compared astronomy to astrology. Students identified their own “sun signs” and then found humor in reading some of their horoscopes.

Some teachers used the lesson as an activity to enhance their student’s most recent studies. The lesson for the 2nd grade class was directly related to the unit on ancient Asian civilizations that they had just finished and the ancient Greek civilizations they were currently studying.

The 4th grade class used the Starlab as a way to learn more about the Native American stories and culture they were studying. The 6th grade class enjoyed learning about Greek mythology as it related to *The Lightning Thief*, a novel they were reading.

(Wikipedia explains: “*The Lightning Thief* is a 2005 fantasy-adventure novel based on Greek mythology, the first young adult novel written by Rick Riordan, known for his Percy Jackson novel series. It is the first novel in the Percy Jackson & the Olympians series, which charts the adventures of modern-day 12-year-old Percy Jackson as he discovers he is a demigod, the son of a mortal woman and the Greek god Poseidon. Percy and his friends, Annabeth Chase and Grover Underwood...go on a quest to prevent a war between the gods Zeus, Poseidon and Hades.”)

The planetarium was also used, in a unique way, as a motivational activity to promote discussion in the 7th grade “Home & Careers” class. The students were starting a unit on consumerism and advertising. The teacher posited, “Ancient peoples believed the myths and legends that were presented to them the same way unsuspecting consumers often believe the claims of cunning advertisers. By analyzing the types of techniques advertisers use to in-



Top: Kindergarten students are very excited to enter the dome with this dynamic presenter! Center: The portable dome is a popular attraction in shopping malls. Bottom: Primary School students enjoyed this special science event. Pictures provided by Hiroshi Futami.

fluence buyers, the students will hopefully become wiser, more discerning consumers.”

This is certainly a very different take on the ancient stories! I would have liked to be

in on that discussion. I wonder if any of the students questioned this teacher’s analogy, especially since, many times, the ancient stories were held as “truths” in the religions of some of these cultures and someone in the class might not have been very happy about the assumptions of the discussion!

The Iroquois in my state of New York even take offense if you call their creation stories “myths.” One elder asked me if I considered the story of Jesus, Mary and Joseph a myth. That told me that their cosmological stories have a religious or spiritual significance to them even today.

I think it is important not to be cavalier about the cultural significance of storytelling.

So, although we can respect the effort to justify and use the planetarium visit by crossing curriculums, this was quite a stretch and possibly offensive to some members of the community. For the article: [www.facebook.com/media/set/?set=a.574435312641944.1073741851.230047593747386&type=3](http://www.facebook.com/media/set/?set=a.574435312641944.1073741851.230047593747386&type=3)

These BOCES provide a way for schools to experience the planetarium in two ways, by teachers being trained to rent the units and teach lessons, and/or by a specialist who can bring the planetarium and present the lessons. A few BOCES locations make both options available.

Digital planetariums are becoming popular and many of these BOCES are investing in them. The lessons include typical astronomy content, but many locations are now expanding to include other sciences and the arts.

### News from Buffalo

There is another way that schools and other venues in New York State receive portable planetarium programs—by small business owners.

I asked my good friend Paul Krupinski, a small business owner, to give me an update from his “neck of the woods.” Paul runs his

business with an opto-mechanical Starlab planetarium.

He reported, "Business is down big in my portable world...14 less schools on my calendar this year than last as of this date...so I guess I'm considered under employed. Same in Rochester. (Paul presents programs at the Strassenburgh Planetarium in Rochester) I think teachers are foregoing field trips, whether they're in school or away from school, to concentrate on ELA's (state tests) in math and English.

"I've recently been to Stella Niagara Educational Park for the 2014 Niagara County Science Fair. I presented six short mini-lessons (every 30 minutes for three hours) about light and how astronomers use different wavelengths of the electromagnetic spectrum to capture images of celestial objects which reveal new information that wasn't seen in the visible part of the spectrum. Each session also had a mini star show. All really enjoyed the portable dome!

"Even though times are tough, here's why I (we) do this sort of job. I have been going to a school district in Niagara County called Newfane. I visit pre-K, kindergarten, grades 2, 4 and 5 every year. On Wednesday, I visited the Newfane Middle School for 5 sessions of 5th grade students for a solar system lesson and star show.

"After one of the classes, I had a 10- or 11-year old 5th grade girl tell me that I'm the reason she's interested in science...since her kindergarten visit! That made my week!"

## Pacific Planetarium Association

Digitalis Education Solutions, Inc. announced a new system for portable domes. It is called the Digitalis Iota. The company explains: "The Iota is designed for use in domes up to 6-m/20-ft in diameter, and it projects a beautiful 1200-pixel diameter circle over a full dome with no blind spots or cut outs...Never before has a complete system (fisheye projector, control computer, user interface) been this small or powerful...From the time you open the transit case to projecting the sky takes only about two minutes."

I especially like that it is so compact and the case has built in wheels and an extendable handle! For more information: [DigitalisEducation.com/iota](http://DigitalisEducation.com/iota).

## New Portable Systems from Israel

The Bareket Observatory, in Israel, has developed the EMERALD™ digital fisheye lens projector line for full-dome projection in planetariums and other domed-based theaters. They are making two very compact portable



"Mr. K" welcomes the audience in this fun picture, which was taken January 29, 2014 at St. Stephen's on Grand Island, New York for a visit during Catholic Schools Week. Picture provided by Paul Krupinski, director/owner of Mr. K.'s Mobile Dome Planetarium.

projectors available at this time: an HD projector for up to 7 meters and another for up to 10 meters.

The company's portable domes are made of two layers. The external color is black/blue and the internal projection surface is matte gray. The structure includes a walk-in inflated door and a horizontal inflatable ring (spring-line). Domes are available in sizes from 5- to 8-m in diameter. Larger domes (up to 12-m) can be ordered. For more information, go to [www.shop.bareket-astro.com](http://www.shop.bareket-astro.com).

## Start thinking deadline

It is not too early to think about this deadline: September 15 is the yearly deadline for the applicants of "An Experience in Italy for an American Planetarium Operator."

Participants must send an application that includes your full name, complete address, year of birth and your curriculum vitae. Send this information along with a cover letter explaining why you wish to be considered for this experience.

You must also include the text of three lessons (or variations of the same lesson), with activities and stories, which you would like to present (1) for students, (2) for teachers and (3) for the public.

Please include a list of specialized vocabulary or any other relevant materials that you feel would strengthen your application. Before applying it would be wise to consult some of the previous winners to ascertain the best approach.

Send your application to: Loris Ramponi, Osservatorio Serafino Zani, Via Bosca 24, 25066 Lumezzane, Italy. Or you can email it to Loris at: [osservatorio@serafinozani.it](mailto:osservatorio@serafinozani.it) or to [megrez58@gmail.com](mailto:megrez58@gmail.com)

## "Pages of Stars"

The Astronomical Observatory Serafino Zani and the Mobile Planetarium Committee are announcing a new competition, "Pages of Stars." The competition is a simple proposal with the goal of building a collection of short audio clips (maximum 3-5 minutes each) that can easily be shared among planetarians using mp3 files.

Planetarian colleagues from around the world are invited to prepare a short text, in English, that can be read under a planetarium dome. The text can be:

- an astronomical and scientific commentary, or
- a classical Greek (or another culture's) sky story, or
- an original story or a poem (any kind of topic) with some astronomical details or with an event that happens under the night sky

(including the name of some stars or constellations or other sky objects visible with the naked eye).

The author (or a collaborator of the author) must read the text aloud (in English) and record this story as an mp3 file.

A committee, selected by the IPS Portable Planetarium Committee in collaboration with the Astronomical Observatory Serafino Zani will select the winners, and the text of the best entry will be published in the Mobile News column of the *Planetarian*, while the three best works will be made available on the IPS Free Media Webpage. ([www.ips-planetarium.org/?page=voice](http://www.ips-planetarium.org/?page=voice))

The winner will receive a memory plaque on the occasion of the "Day of Planetaria," which occurs in March.

Participants must send, before December 31, an application that includes:

1. the written text of the commentary, story or poem,
2. the audio registration as an mp3 file (without music) and
3. a participation form of the author (full name, complete address, year of birth and your short curriculum vitae) and the name(s) of any collaborator(s).

All entrants must agree to release the work under the Creative Commons Attribution 4.0 International License ([creativecommons.org/licenses/by/4.0](http://creativecommons.org/licenses/by/4.0)) or choose to make their work public domain ([creativecommons.org/public-domain](http://creativecommons.org/public-domain)).

Send this information by mail or email to:

Susan Reynolds Button, [sbuttonq2c@gmail.com](mailto:sbuttonq2c@gmail.com), IPS Portable Planetarium Committee, 8793 Horseshoe Lane, Chittenango, New York 13037 USA or to Loris Ramponi, address given earlier. ☆



NARRATED BY LIAM NEESON

MUSIC BY RICHARD FIOCCA

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HOLES**

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Produced by



DENVER MUSEUM OF  
**NATURE  
&  
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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 Cosmos 2014 Large Area Space Telescope project and the National Science Foundation. It is directed by Thomas Lauer and cowritten with the Spitzer Center for Supercomputing Applications, Science writers include Dr. Andrew Hamilton (University of California) and Dr. Lorne Cominsky (Sonoma State University). Distributed by Spitz, Inc. Approximately 23 minutes. Image © Denver Museum of Nature & Science.



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# Sound Advice

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jeffb@bowentechnovation.com

## Watts Up? Audio System Speakers for the Dome, Part 1

Perhaps the most important function of the planetarium theater and presenters is to inspire the visitor to study the “real deal” outdoors and look at the actual heavens and cosmos in more detail.

Similarly, the objective of these “Sound Advice” columns is not to cover all the details regarding the subject, but rather to encourage you to study the topics in more detail. That is very true of this issue where I could write entire volumes on this subject. So here we’ll keep it simple and hopefully useful.

This subject needs to be a two-parter to save valuable space in *Planetarian* for other important subjects.

Part 1 builds the foundation for Part 2.

The more you understand these terms and concepts, the better your purchasing specification will be for a new audio system.

### A glossary starts us off

First, a brief glossary s related to this article.

- **Speaker System:** The speaker box (enclosure) and the internal components, such as drivers, horns and crossovers. For this article we will call a speaker system a speaker.
- **Two-way:** See Figure 1. A two-way speaker system separates the frequencies into two bands called the low and combined mid-high frequencies. This is the most common



Above, Left, Figure 1: two-way speaker system. Right, Figure 2: three-way system. Right, Figure 3: frequency response. All images provided by author..

speaker type in domed theaters. A subwoofer is usually added to two-way speaker systems.

- **Three-way:** See Figure 2. A three-way speaker system separates the frequencies into three bands called the low, mid and high frequencies. This type system provides the most detail and clarity for the best systems—at a price. A subwoofer is still usually added to three-way speaker systems.
- **Driver:** Drivers are the actual transducers that generate sound waves by moving air, i.e. driving air into motion. The four types of drivers are:
  1. High frequency (HF) drivers. Sometimes called “tweeters.” These reproduce the high or “treble” frequencies.
  2. Mid-frequency (MF) drivers. These reproduce the frequencies between the HF and LF drivers.
  3. Low frequency (LF) drivers. Sometimes called “woofers”. These reproduce the low or “bass” frequencies.
  4. Sub-woofer drivers (SF). These drive the sub-frequencies below the LF drivers.
- **Frequency:** Just like light, sound is divided into frequency bands. In the human hearing range low frequencies (LF) are typically considered 20Hz-250Hz. High frequencies are 3-4kHz and up. Mid frequencies are between these and can even be divided in low-mid, mid and high-mid for high level audio engineering conversation.

• **H<sub>z</sub>:** Time for the old physics refresher. We measure audio frequencies in Hertz, abbreviated as Hz. Hertz is a number for frequen-

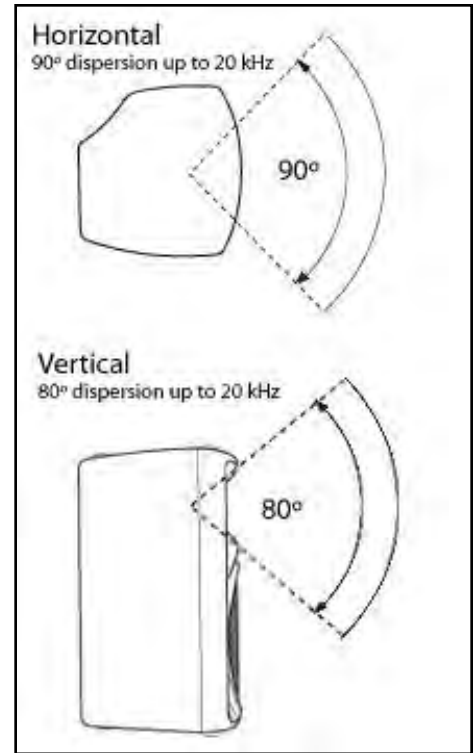
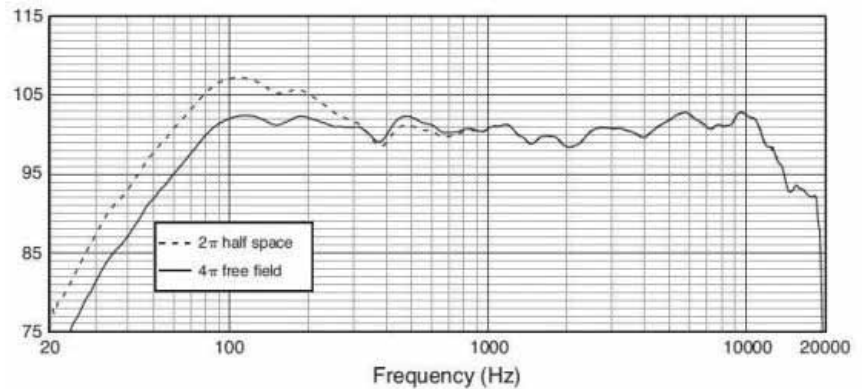


Figure 4: coverage pattern

cy cycles or “waves” per second. The higher the number of Hz... the higher the frequency. The lower the number of Hz... the lower the frequency. Once you hit 1000 Hz the numbers are often represented by kHz (kilohertz). So 2000Hz is also 2kHz.

- **Frequency Response:** See Figure 3. The range of frequencies reproduced by the speaker. This is measured by such terms as “28 Hz to 20 kHz+/- 3dB.”
- **Equalization:** The use of an electronic equalizer to even out peaks and dips in how the speaker system interacts with your room acoustics, such as shown in Figure 3. This is different for every room and is often misused.
- **Pattern:** See Figure 4. Also known as “coverage,” this term describes the average horizontal and vertical angles of sound generated by the speaker system. This is described

(Continues on page 86)





# Book Reviews

**April S. Whitt**  
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## *The Astronaut Wives Club: A True Story*

Lily Koppel, Grand Central Publishing, New York, 2013

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

In today's world of reality TV, we sometimes forget that this genre started many decades ago, not necessarily on prime time, but behind the scenes, with members of history that nowadays seem all but forgotten.

As the nation watched with bated breath for the escapades of the first sets of astronauts, there was a parallel universe of persons that were as important as those who explored our upper atmosphere and, finally, the moon: the women they came home to—mainly— who were met with almost no fanfare.

They all started as regular homemakers, as was the norm at that time, and most as just military wives who mainly lived in regular military housing. They were ordinary wives who sometimes were invited to a social with Jackie Kennedy, had magazine photographers on their lawns, and prepared their hair for the next television interview.

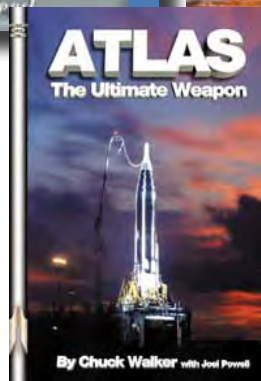
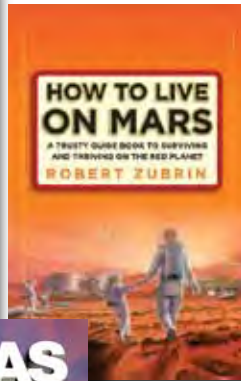
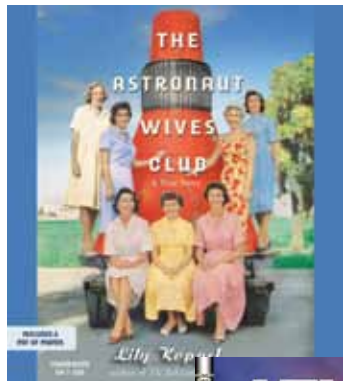
Their lives consisted of waiting for their husbands to come home, hoping that their moments of fame wouldn't cause too much friction when they returned to the normalcy of weekend family time and hoping, in fact, that their famous spouses actually would return.

The first seven astronaut wives soon realized they needed a support group, to keep each other both down to Earth and capable of understanding their husbands, who were now as famous as Betty Crocker and Mickey Mouse. The instigator for the Wives Club was Deke Slayton's wife Marge, and they met every few weeks, often having to scramble for baby-sitters to attend.

They were all going through the same sit-

uations: having husbands gone for days as a time; acting as both parents to their children, who saw their fathers on TV more than in the flesh; having photographers shadowing them, and being given their own ghostwriters, as *Life* magazine, in a September, 1959 special, needed an article "written" by each of the seven Mercury wives.

All of them admitted to feeling strange as to the effects of this new wrinkle to their lifestyle; as Betty Grissom not-



ed, "They act like I'm the most interesting thing since sliced bread."

*The Astronaut Wives Club* is the story of typical 1950s house-

wives who, with a wave of a pen, became the most famous women in the U.S. As their numbers increased, from the original Mercury seven, to the Gemini nine, to the "final" fourteen as a result of the advanced Gemini and final Apollo missions, all readily became members of this most exclusive sorority.

Through it all, this loose association of women literally thrown into infamy was, for many of them, what they needed to keep them grounded in family life and child-raising. This account of those women, although sometimes long and drawn out, still portrays a part of history that needs to be known.

## *Atlas: The Ultimate Weapon*

Chuck Walker with Joel Powell, Apogee Books, Burlington, Ontario, Canada, 2005

Reviewed by Francine Jackson.

What we don't know from the outside cover is that the subtitle of this book is "By Those Who Built It," which takes the whole concept of a book on what we might think is just about a regular missile to a first-person account. Imagine! Actually hearing the history of this machine, which has been so much a part of our life, from those responsible for it.

The first page introduces the topic by bullet points indicating the Atlas's importance in history; its cost (billions of dollars); and its physical needs, including employing over 100,000 people, requiring hundreds of miles of wiring and plumbing supplies, the moving of millions of yards of dirt, and the pouring of millions of tons of concrete. It also needed the cooperation of people in almost every state and many foreign countries, resulting in a machine that was faster, higher, and could travel farther than any previous machine ever built.

The first lesson we learn is the difference between a rocket and a missile. Then we move on to a guided missile. From there, we begin the history of these machines: why they needed to be built (the Cold War was a great impetus); who were the leading scientists and engineers, both here and in the Soviet Union; and what was each component and its necessity to the overall function of the final product.

Each year of the program is meticulously detailed, up to the final closing of the Atlas bases in 1966. With each page the reader will feel there, from the initial idea, to the life-size wooden mockup, to the final days. You will become familiar with every person who performed a part, no matter how small, but significant, needed to put such a weapon in the air.

Once again, Apogee has done a superb job of historically mapping what to some of us might not have been an important part of our past, and yet bringing it to the forefront of the reader, humanizing what was called "the ultimate weapon" by those who were required to bring this to life. You will feel the life in this book. As with just about every other book coming from this publisher, I highly recommend you make friends with Atlas.

## *How to Live on Mars: A Trusty Guidebook to Surviving and Thriving on the Red Planet*

Robert Zubrin, Three Rivers Press, New York, 2008

Reviewed by Francine Jackson.

In 1999, Robert Zubrin sponsored a colloquium on the subject of Mars, the theme of which was why we were not there yet. Through the years he has continued to push

for this hoped-for Martian colonization, and now he has reached the apex (so far) of his work: the definitive book on living and working on Mars.

"This" Zubrin, who was born in 2071, gives us everything we need to know about getting off Earth and becoming comfortable on this new environment. He admits there are problems that must be overcome, but each is defined and solved to the best of his knowledge.

He begins with the different ships available for newbies from Earth, from nuclear-propulsion rockets—good, but they often overshoot the planet—to the little-known cargo ships—slower, but you will land on Mars. Then, once there, he describes how to dress, with space-suit choices running from elastic, form-fitting garments (a la Raquel Welch), to the traditional Neil Armstrong pressurized unit.

Once on Mars, you now have several decisions to make, not the first of which is where and how to live, that is, choosing a housing pod. Different structural materials are compared, and selected for the intended homeland.

Of course, to do so, you need a job. What's available? What should you stay away from? Oh, and, how do you eat? Is all food sent in from Earth whenever transports are available, or can you "grow your own"? And meat? Can cows or goats be conditioned for milk and Sunday dinner?

What about creating relationships? Surely not everybody who travels to Mars is doing so as a couple. In fact, Zubrin has even given us a set of pickup lines to use, strictly for Mars. After all, I don't think, "I'm looking for my lost baby goat. I think it ran into your hab. Can I look for it?" will work most places on Earth.

Thank goodness for Robert Zubrin. Although we really haven't started the trek to our new planetary home, he has given us everything we need to feel homey and comfortable in our new environment.

From getting there, to setting up a home-stead, to getting a job, to raising a family, everything is clearly spelled out, ready for the new Martian. Pack your bags, take this little volume with you, and you will be all set for your great new adventure. Good luck!

### *Around the World in 84 Days*

David Saylor, Apogee Books, Burlington, Ontario, Canada, 2008

Reviewed by Tom Callen, former astronomer/program producer at Cosmonova, Stockholm, Sweden

Having worked at the National Air and Space Museum and holding a long interest in manned spaceflight, I have read many books about NASA's programs, from Mercury to Apollo and even the Apollo-Soyuz Test Project (ASTP). Yet, somehow I managed to have not read anything about Skylab before.

I've also owned space-related books from Apogee in the past. If you're already familiar with this publisher you won't be disappointed as *Around the World in 84 Days* is up to their usual high standards of research and quality.

Coming at the tail end of the prestigiously successful Apollo moon landings and before the media-grabbing ASTP, Skylab never got the attention that it rightly deserved at the time.

This book does a lot to set that right by highlighting the career of "Original Nineteen" astronaut, Gerald P. "Jerry" Carr and the Skylab 4 mission. At the time it set a longest duration space flight record, which would later contribute important information to both the space shuttle (STS) and the International Space Station (ISS).

In addition to an informal Introduction written by Carr himself, there is also a forward by fellow Skylab 4 astronaut Bill Pogue, and an epilogue by Ed Gibson, the third member of the crew; a nice touch.

Another nice addition is a DVD containing archival NASA documentaries and training footage from the Skylab program, as well as Carr in his capacity as a member of the Apollo 12 support crew.

Carr kept an on-orbit diary during this long-duration flight and extracts have been included, giving a unique perspective of what was going through the astronaut's head during the mission. And since this was for his personal use, Carr does not mince words:

Mission Day 4. November 19 (1973): Still behind and dog tired. We've got to catch up and get a routine going! So far space flight isn't much fun. Don't even have time for a look outside. They had us scheduled for a fire drill today. What a laugh! It's been a Chinese fire drill ever since we got here.

Why the initial frustration? One crew member was struggling to get over space sickness while they all tried to stow added last minute experiments and equipment brought along in their Command Module and having to cope with storage lockers whose contents did not match the supplied lists after the previous two manned Skylab missions.

It did not seem to get better, either, as their

amount of daily work accomplished was compared to those previous flights, which were not as long nor as crowded with tightly scheduled items as Carr's. This was also the second only all-rookie flight in NASA's history, the first since Gemini 8 (Armstrong-Scott) in March 1966. Carr, Pogue and Gibson had never been in space before.

One wonders what sort of an upbringing and background the astronauts had brought them to such a high standard of discipline and competence. Carr's early years in Santa Ana, California are detailed, as well as his career as a Marine aviator. By the time that he and the fifth group of NASA astronauts were onboard at the agency, even they had begun

to think of themselves as not so very unique, which led to the origin of their own humorous "Original Nineteen" tag.

Three made it to the moon, one perished in a car accident, another was grounded for medical reasons, and the rest ended up in Skylab and future STS flights. These astronauts may not have all been household names, but that didn't mean that they didn't have "The Right Stuff."

If you have been around planetariums long enough you already know that many of the astronauts had training in celestial navigation at the University of North Carolina's Morehead Planetarium. Included in the book is a brief mention of this (on page 60), as well as two photographs from

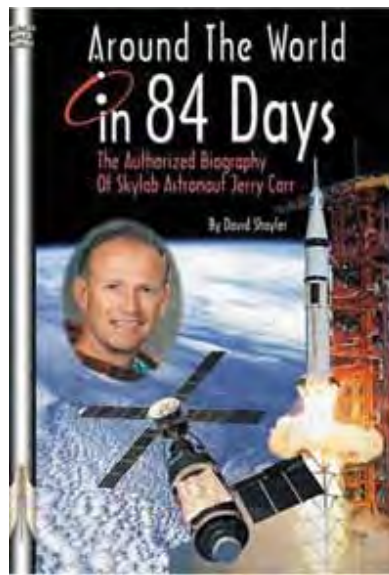
when Carr was there under the dome.

While Skylab was overshadowed by the Apollo project, its benefits were fully appreciated afterwards with both the STS and ISS programs. Even the Soviets admitted to closely following and using Skylab results, particularly those from Jerry Carr's 84 day mission, in their planning for their own long-duration space station, MIR. And with good reason; at the time Skylab 4 was the longest running and most detailed in-flight medical experiment with a veritable gold mine of data on the effects of weightlessness on the human body.

One of the interesting things about such accounts are some of the "tips and tricks" shared. Two useful tips: to keep the inside of an astronaut's EVA suit smelling fresh, apply some Old Spice® men's cologne to the interior under-arm areas, while the helmet visor can be kept from fogging up during long space walks by wiping them first with Joy® dishwashing liquid.

Such tips would have only been useful on long duration flights, such as on a manned space station. Apollo 11's Neil and Buzz only

*(Continues on page 86)*



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## Alan J. Friedman, IPS past president

Alan J. Friedman, 71, a past president of the International Planetarium Society and a physicist who specialized in communicating science to nonscientists as the director of the New York Hall of Science in Queens, New York, died of pancreatic cancer on May 4, 2014 in Manhattan. He was 71.

Alan, who served as IPS president from 1985-86, was born on November 15, 1942, in Brooklyn. His father, George, was an insurance salesman; his mother, Eleanor, was a bookkeeper. The family moved to Carrollton, Georgia, when Alan was a child, and then to Atlanta a few years later.

He studied physics at Georgia Tech before going to Florida State. He taught at Hiram College in Ohio and received a National Endowment of the Humanities grant to study literature, which he did at Berkeley.

He then became director of physics and astronomy at the Lawrence Hall of Science at the University of California there and served as a consultant to Cité des Sciences et de l'Industrie, the French national museum of science and industry in Paris.

When Alan arrived at the New York Hall of Science in 1984, he arrived at a gutted building with no exhibits and light fixtures and an inch of water on the floor. It had been closed since 1981.

The City of New York appropriated \$2.9 million for renovations, to include construction of a 13,000 square-foot mezzanine, a 100-seat planetarium, and new lighting, heating and cooling systems. The museum's board pledged to raise additional private funds for new exhibits and programs. Both of these funding efforts fell through and, with a smaller appropriation, the project started again and Dr. Friedman was hired.

By 2006, when Dr. Friedman retired, he had overseen expansion projects totaling more than \$100 million, and the full-time staff had expanded to 100. In his final year



Alan J. Friedman

on the job, the hall recorded nearly 447,000 visitors.

In 1996, a \$13 million expansion gave the hall a new entrance rotunda, driveway, cafe, gift shop and theater. A year later, the 30,000 square-foot Science Playground opened, inspired by outdoor science parks Alan had discovered on a trip to India.

In 2001, the rockets outdoors were dismantled, shipped to Ohio for restoration, and returned to the new Rocket Park in 2004. Later that year, the \$92 million North Wing opened.

His approach was as simple as it was revolutionary. "Normally museums get together the best experts they can," he said, "have them design the exhibits, build them, put them out—and pray they work." But Alan's approach to curating exhibits was a bit more iterative. "If they don't get the message across, we'll change them."

After retirement, Alan became an advisor and consultant to museums and universities worldwide. He ultimately had a 40-year career. He mentored hundreds of museum professionals, many of whom have written to the Hall of Science to share their memories of Alan.

We know how important he was to the Hall of Science, but there's also ample evidence of his impact and influence elsewhere. He helped us make sense of international student assessments. He rallied his fellow museum directors to stand with one of their besieged colleagues. Just last month, he looked at what is happening to Detroit's art museums and wondered "what exactly were the cost-benefit ratios of Newton's laws, or of the Parthenon?"

In addition to his wife, the former Michaele Thompson, a mystery novelist whom he met at Florida State and married in 1966, Dr. Friedman is survived by a sister, June Entman.

- From the *New York Times* and Dan Wempa, New York Hall of Science

## Air & Space gets \$30M donation

The Smithsonian's National Air and Space Museum in Washington, D.C., is the recipient of a \$30 million donation from Boeing to remodel the Milestones of Flight exhibit. Part of the update will include improving visitor flow, enhancing the story of spaceflight to people born after 1972 who are now unfamiliar with it, and placing the Apollo-era lander as the centerpiece.

Some new exhibits planned include a model of Star Trek's Enterprise and early satellite communications devices.

The renovation is hoped to be finished in 2016, coinciding with the museum's 40th anniversary and Boeing's 100th.

## You rate when you get a tie

Did you know that Jerry R. Ehman, the astronomer at the former Big Ear Telescope in Ohio, has his own tie? Ehman is responsible for the "wow" comment written on the charts that recorded the historic radio signal.

Bay Cooper, the purveyor of mens' accessories that offers the tie, suggests wearing it and making a "wow" statement of your own. Find more ties with interesting stories at baycooper.com.

The radio telescope, located in Delaware, Ohio, was operated by Ohio State University. The strong signal lasted for 72 seconds, and has never been detected again. The university stopped operation of the telescope in 1997 and it was later destroyed after the land was sold to developers.



## A new Dark Sky Park in Michigan

Michigan now has an International Dark Sky Park. Called The Headlines, the park is 600 acres of old-growth timber in Emmet County, located along Lake Michigan and west of Mackinaw City. The county itself has passed laws to curtail the growth of artificial light, and the land in and around the park has been zoned for natural conditions and strict light limits.

## Planetarium operations workshop

The Parc Astronòmic Montsec in Catalonia, Spain, is holding its first Montsec Workshop for Planetarium Operations and Live-show Designers, from 9-13 June, 2014 in the Montsec mountain region straddling the counties of La Noguera and Pallars Jussà in the province of Lleida. This is one of the darkest regions in southern Europe and has been certified as a Starlight Reserve.

(Continues on page 86)



# DOWN TO EARTH

While hunting for fossils, *The Zula Patrol* discovers that the villainous Deliria Delight has been illegally dumping her company's toxic trash in Earth's prehistoric past. *The Zula Patrol* must find and catch her, before her actions ruin the planet. In the process, our heroes learn all about the formation and development of Earth, and the life forms who call it home. 24 minutes.



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*The Zula Patrol* is on a scientific expedition using their loyal pet Gorga's ability to collect and bottle all kinds of weather. When nefarious villain Dark Truder tricks Gorga into stealing the weather from Earth and other planets, *The Zula Patrol* goes after him, learning all about weather - both terrestrial and interplanetary. 24 minutes.



# Under the Weather!



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### Sites for the bucket list

Wow. Talk about a vacation in paradise! The BuzzFeed submission calls it travel destinations for science nerds, but I call it a wonderful compilation of must-see places around the world, whether you're a science nerd or not.

Go to [www.buzzfeed.com/hannahcgregg/essential-travel-destinations-for-science-nerds](http://www.buzzfeed.com/hannahcgregg/essential-travel-destinations-for-science-nerds) and see if you agree.

Only one planetarium is mentioned specifically, the Hayden in New York City, but several international science centers with domes make the list, as does the Neil Armstrong Museum, the Griffith Observatory and the Hale Telescope at the Palomar Observatory.

And, in what has to be an inadvertent omission, the Adler Planetarium is not included, although Chicago's Field Museum and the Museum of Science and Industry are there.

Above, the The City of Arts and Sciences in Valencia, Spain, was Number 22 on the list, but I've placed it near the top on mine. Learn more about this striking fusion of science and beauty at [www.cac.es](http://www.cac.es). Photo courtesy of The City of Arts and Sciences.

(New, continued from page 84)

This workshop is oriented to planetarium people related to creation and development of live shows in the dome. Among the topics to be covered are preparing scripts to manage live shows, presenting skills in the planetarium, and popular image formats and their tools. For more, go to [www.parcastronomic.cat/live](http://www.parcastronomic.cat/live).

### Everyone's Universe receives award

Congratulations go out to Noreen Grice for receiving the 2014 Independent Publishers of New England (IPNE) book award for Informational Non-Fiction Book for the second edition of *Everyone's Universe*. The book compiles accessible astronomy facilities and provides tips on how to provide meaningful programs across a wide variety of disabilities.

A 30-year planetarium professional and pioneer in making the planetarium environment accessible, Noreen also is the planetarium educator/manager at The Children's Museum in West Hartford, Connecticut.



Noreen Grice

### Chuck Rau moves to St. Louis

Chuck Rau, co-founder of ChromaCove LLC (controllable LED cover lights) in Cleveland, Ohio, has been named the new planetarium sales director at Seiler Instrument, based in St. Louis, Missouri, a contract manufacturing company specializing in high precision machining and optical instrument assembly and the only distributor of Zeill Planetarium in the United States and Canada.

Chuck started his planetarium affiliation in 1994 as a laserist for AVI at the Carnegie Science Center in Pittsburgh. Past jobs have involved a variety of lasers and laser shows and a time as producer/educator at the Mayborn Planetarium at Central Texas College in Killeen.

He also will continue with remotely with ChromaCove. ☆



Chuck Rau

(Sound, continued from page 80)

in degrees such as 90° x 50°, where 90 is the width and 50 is the height of the coverage. If you select a speaker with too wide a pattern you will spray the walls and dome with unneeded sound energy which degrades the audio in the theater. If the pattern is too tight the audience won't be properly covered.

- **Watts:** Not to get too deep, but just think of this as a measurement of how much power an amplifier can deliver to speaker system drivers.

So, if you get familiar with the terms listed above that will get you ready for the next issue.

Some questions we will answer will include the following. The answers will surprise many of you.

- Should the speaker specification always be 20-20K frequency response?
- How much amplifier power do I need?
- Do speaker systems blow up from too much power?
- What is tri-amping? Is it needed to have the best systems?
- Are bigger speakers always better?
- Will lots of speakers make better coverage and a louder sound?
- Can I place a subwoofer anywhere? Isn't it omni-directional?
- How do you "eq" the system?

### Reader question

**Q:** Our various shows have different volume levels for the narration channel. The subwoofer levels vary greatly too. And some shows don't have any subwoofer channel. It is really a problem. How do we solve this?

**A:** Please start by reading my article in the March 2014 *Planetarian*. It describes how you use an audio processor to adjust the levels for each channel of each show and then save these as presets. If you don't have your copy of *The Planetarian* handy, you can read the article at [www.bowentechnovation.com/ips](http://www.bowentechnovation.com/ips). ☆

(Books, continued from page 82)

spent about two-and-a-half hours walking on the moon's surface, so there was no need for freshening up their EVA suits as compared to the 84 days for Skylab 4 and excursions up to 6 or more hours in length.

Colonel Jerry Carr retired from Marine aviation in September 1975 and NASA in June 1977. Taking part in an STS flight was more years than he wanted to wait. Wishing to test private sector waters, Carr joined Houston-based consult engineering company, Bovay Engineers, Inc., and he performed work for aerospace-related companies as well.

The book concludes with extensive sections on what the other members of Carr's astronaut class were doing at the time of publi-

cation, an update on the careers of the other Skylab astronauts as well as follow-ups on his various family members; his oldest son, for example, was at one time director of Public Affairs at NASA/Johnson Space Center.

The only other thing that I would have liked to have seen was an appendix with a short summary list and description of the various experiments carried onboard Skylab 4.

If you have an interest in the manned space program and have a "Skylab gap" as I did, I couldn't recommend a better book to fill it than this. Perhaps someday Apogee will even get around to publishing Carr's complete on-orbit diary, heavily supplemented with color pictures from the mission. ☆



# Planetarians' Calendar of Events

[www.astrofiliresciani.it/Planetari/Internationa\\_Calendar.htm](http://www.astrofiliresciani.it/Planetari/Internationa_Calendar.htm)

Compiled by Loris Ramponi - [osservatorio@serafinozani.it](mailto:osservatorio@serafinozani.it)

## 2014

- 9-13 June 2014. 1st Montsec Workshop for Planetarium Operators and Live-show Designers, Montsec Mountains (Lleida, Spain). [www.parc-astronomic.cat/live](http://www.parc-astronomic.cat/live)
- 17-20 June. IAAPA Asia Attractions Expo, Beijing, China. [www.iaapa.org](http://www.iaapa.org)
- 18-21 June. IPS-Macao International Fulldome festival (IPS-MIFF), Macao Science Center, Macao. [www.msc.org.mo](http://www.msc.org.mo)
- 21-26 June. ESOF 2014, Euroscience Open Forum, "Science building bridges", Copenhagen. [esof2014.org](http://esof2014.org)
- 21-22 June. International Planetarium Society Council Meeting, Beijing, China.
- 23-27 June. 22nd International Planetarium Society Conference, Beijing Planetarium, China. [www.ips2014.org](http://www.ips2014.org), contact mail Dr. Zhu Jin, [jinzhu@bjp.org.cn](mailto:jinzhu@bjp.org.cn)
- 15-19 July. Southeastern Planetarium Association, SEPA 2014 Annual Conference, Buehler Planetarium at Seminole State College, Sanford, Florida, USA. Contact: Michael McConville, [mconville@seminolestate.edu](mailto:mconville@seminolestate.edu), [www.sepadomes.org](http://www.sepadomes.org)
- 22-25 July. Western Alliance Conference (Pacific Planetarium Association, Southwestern Association of Planetariums, Great Plains Planetarium Association and Rocky Mountain Planetarium Association), Planetarium, UT Arlington, Arlington, Texas, USA. [LeventGurdemir@uta.edu](mailto:LeventGurdemir@uta.edu), [wacdomes.org](http://wacdomes.org)
- 29 July -1 August. Spitz Summer Institute 2014, Chadds Ford, Pennsylvania, USA. Beginner to Intermediate, for SciDome, Starry Night and The Layered Earth educators. [www.spitzinc.com/institute](http://www.spitzinc.com/institute) or contact [jtowne@spitzinc.com](mailto:jtowne@spitzinc.com)
- 4-7 August. Spitz Summer Institute 2014, Chadds Ford, Pennsylvania, USA. Intermediate to Advanced, for SciDome, Starry Night and The Layered Earth educators. [www.spitzinc.com/institute](http://www.spitzinc.com/institute) or contact [jtowne@spitzinc.com](mailto:jtowne@spitzinc.com)
- 10-14 August, 41st International conference and exhibition on computer graphics and interactive techniques, SIGGRAPH 2014, Vancouver, Canada. [s2014.siggraph.org](http://s2014.siggraph.org)
- 13-15 August, Live Interactive Planetarium Symposium (LIPS), Treworgy Planetarium, Mystic Seaport, Connecticut, USA. Contact: Brian Koehler, [brian.koehler@mysticseaport.org](mailto:brian.koehler@mysticseaport.org) or Karrie Berglund, [karrie@DigitalisEducation.com](mailto:karrie@DigitalisEducation.com). [LIPSymposium.org](http://LIPSymposium.org)
- 31 August. Deadline for the applicants of "An experience in Italy for a French-Speaking Planetarium Operator," in collaboration with APLF. [www.astrofiliresciani.it/Planetari/Week\\_in\\_Italy/Week\\_Italy.htm](http://www.astrofiliresciani.it/Planetari/Week_in_Italy/Week_Italy.htm)
- 3-5 September. Digistar Users Group, DUG 2014, Meeting in Hamburg & Kiel, Germany. Contact: Markus Schack, [markus@dug2014.de](mailto:markus@dug2014.de), [www.dug2014.de](http://www.dug2014.de)
- 5 September. International Observe the Moon Night (InOMN). [obser-vethemoonnight.org](http://obser-vethemoonnight.org)
- 10-13 September. Middle Atlantic Planetarium Society, Annual Conference, Maryland Science Center's Davis Planetarium, Baltimore, Maryland, USA. Contact: Patty Seaton, [pxts13@yahoo.com](mailto:pxts13@yahoo.com); [www.mapsplanetarium.org](http://www.mapsplanetarium.org)
- 15 September. Deadline for the applicants of "A Week in Italy for an American Planetarium Operator," in collaboration with IPS Portable Planetarium Committee. [www.astrofiliresciani.it/Planetari/Week\\_in\\_Italy/Week\\_Italy.htm](http://www.astrofiliresciani.it/Planetari/Week_in_Italy/Week_Italy.htm)
- 19-20 September. British Association of Planetaria (BAP), annual meeting, Thinktank Birmingham Science Museum, Birmingham, United

- Kingdom. Contact: Dr Jenny Shipway, [president@planetaria.org.uk](mailto:president@planetaria.org.uk); [bapconference.org.uk](http://bapconference.org.uk)
- 20-23 September. Giant Screen Cinema Association, GSCA 2014 International Conference and Trade Show, Toronto, Ontario, Canada. [www.giantscreencinema.com](http://www.giantscreencinema.com). Contact: Tammy Seldon, [tammy@giantscreencinema.com](mailto:tammy@giantscreencinema.com)
- 26-28 September. Russian Full-Dome Festival, Large Novosibirsk Planetarium, Novosibirsk, Russia. Contact: Sergey Maslikov: [s.maslikov@mail.ru](mailto:s.maslikov@mail.ru), [www.nebo-nsk.ru](http://www.nebo-nsk.ru)
- 1 - 5 October. XIV Meeting of the Association of Brazilian Planetarium (ABP), Goiânia and Anápolis Planetariums, Goiás State, Brazil. Contact: [contato@planetarios.org.br](mailto:contato@planetarios.org.br), [www.planetarios.org.br](http://www.planetarios.org.br)
- 4-10 October. World Space Week, [www.worldspaceweek.org](http://www.worldspaceweek.org)
- 6-8 October. Russian FullDome Festival, Large Novosibirsk Planetarium, Novosibirsk, Russia. Contact: Sergey Maslikov at [s.maslikov@mail.ru](mailto:s.maslikov@mail.ru). [www.nebo-nsk.ru](http://www.nebo-nsk.ru)
- 18-21 October. Association of Science-Technology Centers (ASTC) Annual Conference, North Carolina Museum of Natural Sciences, Raleigh, North Carolina, USA. [www.astc.org](http://www.astc.org)
- 29 October-November 1. Great Lakes Planetarium Association, GLPA Conference, Ball State University Planetarium, Department of Physics & Astronomy, Muncie, Indiana, USA. Contact: [rkaitchu@bsu.edu](mailto:rkaitchu@bsu.edu), [www.glpaweb.org](http://www.glpaweb.org)
- 30 October-8 November. 20th International Symposium on Electronic Art, ISEA 2014, Zayed University, Dubai. [www.zu.ac.ae](http://www.zu.ac.ae)
- 11 December. Deadline of the Stratoscript Compendium Ring 2014, a scripting competition open to everybody by LSS-Planetarium. Contact: [lionel.ruiz@live.fr](mailto:lionel.ruiz@live.fr), [www.lss-planetariums.info/index.php?lang=en&menu=compendium&page=compendium2013](http://www.lss-planetariums.info/index.php?lang=en&menu=compendium&page=compendium2013)
- 31 December. Deadline of the prize "Page of stars" organized by IPS Portable Planetarium Committee in collaboration with Serafino Zani Astronomical Observatory. The prize rules are available at the IPS Mobile Planetarium Committee web page. Contact: Susan Reynolds Button, [sbuttonq2c@gmail.com](mailto:sbuttonq2c@gmail.com)

## 2015

- 15 March. International Day of Planetaria. [www.dayofplanetaria.org](http://www.dayofplanetaria.org)
- 1 May-31 October. Expo 2015, "Feeding the planet, energy for life," World Exposition, Milan, Italy. <http://en.expo2015.org>
- 1-4 May. Gesellschaft Deutschsprachiger Planetarien e.V., GDP 2015, Annual meeting of Society of German-Speaking Planetariums, Potsdam, Berlin. Contact: Karin Flegel: [k.flegel@urania-potsdam.de](mailto:k.flegel@urania-potsdam.de) [www.gdp-planetarium.org](http://www.gdp-planetarium.org)
- 3-4 August. International Astronomical Union, XXIX General Assembly, Hawai'i Convention Center, Honolulu, Hawaii, USA. [astronomy2015.org](http://astronomy2015.org)
- 4-6 September. Nordic Planetarium Association Biennial Conference, AHHA Science Center, Heureka, The Finnish Science Centre, Helsinki, Finland. [www.heureka.fi](http://www.heureka.fi) Contact: Kai Santavuori, [kai.santavuori@heureka.fi](mailto:kai.santavuori@heureka.fi)

For corrections and new information for the Calendar of Events, please send a message to Loris Ramponi at [osservatorio@serafinozani.it](mailto:osservatorio@serafinozani.it) More details about several of these upcoming events is included in the International News column in this issue.

The most up-to-date information also is available online at the IPS Calendar of Events at [www.ips-planetarium.org/?page=calendar](http://www.ips-planetarium.org/?page=calendar)



# Last Light

**April S. Whitt**  
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## Out of the mouths of babes

Occasionally a school group will send thank-you letters written by the students, and I'm always delighted to read them. Drawings usually help in deciphering some of the more cryptic messages, but sometimes the text alone is priceless.

Last fall, a group from a local school visited Fernbank Science Center. The second graders (6- and 7-year olds) saw our version of the excellent full-dome program *Earth, Moon and Sun*, created in the planetarium at my alma mater, the University of North Carolina at Chapel Hill.

The program features the coyote, a trickster character from tales by Native Americans. His misconceptions about the sun and moon are corrected by a patient narrator, and the program has been a hit with our younger school groups.

In our version, we first use the Zeiss star projector to show the current evening sky, observe some constellations, then view *Earth, Moon and Sun* and end with questions from the students.

The planet Jupiter was high enough in the evening sky that it was visible when I brought it up and said, "First person to see a star, raise your hand" Hands went up, and then I could add, "Psych! That's a planet." Their laughter turned to "OOOoooooh!" when the stars actually appeared.

Fernbank also has displays of live animals—snakes and amphibians of various kinds—in the exhibit halls, along with some chickens in a pen outside. Apparently this group toured the exhibits after their planetarium lesson. At least I hope that's what they're mentioning in these notes, original spellings and all:

"Thank you so much for the stars. The wierd part was when I felt like I was sick."

"Thank you for the super pantarium I like the stars. The movie flet like I was sick and it flet like I was moving around."

"Thank you for the lesson on coyote and it was the grat time and it was the supe day on the Earth moon and sun."

"Thank you for the super Star in the top 'Earth, Moon and Sun' and my favorite part is when the funny coyote was doing a funny thinking have a good week J"

"Thank you for showing us about constellations and thank you for showing us sun moon & earth. I felt like I was outside on the grass."

"Thank you for leting us watch the stars and and the moon and the Earth and the sun thank you for leting us watching all of that good by"

"Thank you for leting us see the snaks and the stars it was funny and inporten I love when we saw the cobra." (We don't have a cobra...)

"I love your move it was to funny when that funny coyte ride the Moon like a cow Boy I had a graet time thank you."

"Thank you for watching the 'Earth, Moon, and sun.' And the silly coyote was doing silly things."

"We loved your show I didn't know that the sun is bigger then the moon thank you for averthing."

"Thank you for the show. I rely enjoyed it. But the part that I liked best were the snakes. it was an honor getting to see so much stars."

"...I love the planetarium and Thank you for helping us lern and I lerned that the sun is full of gas."

"Thank you for the show I hop you enjoyed the move becuus I did and agian thank you for invot us to FernBank but I enjoyed that you showed us about the moon and stars."

"I LOVED the planetarium! The chickens where sqwaky! That was the best fild tripe."

"I like the show beaeauase it was cool and fun beauese the movie was fun because the show was so cool and fun." (Spelling improved somewhat as the sentence went on.)

"Thanks for all the fun. We enjoy the show. Your realistic animals were cool. Sum animals creep me out! But you are sooo nice so that's why we all right a not." ("Write a note" perhaps?)

"We had the best! At the planetarium we saw lizzards, and snakes, chickens, and roosters. We loved it! Thanks. We had a good time!"

"You are so nice. I love your job. I learned that the moon is Small and the sun is big. I like the Stars that look like pictures."

"I liked the part when everyone thot a planet was a star and you said it was not a star."

"I learned that groups of stars can make pictures and that the planit that Earth is the second planet from the sun." (oops)

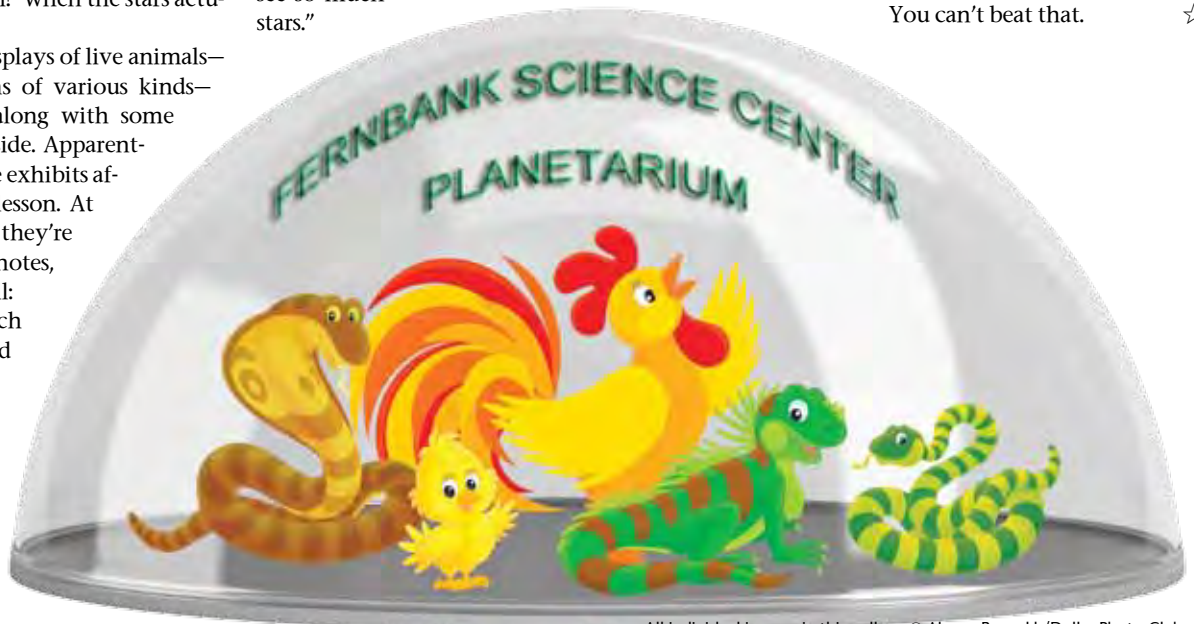
"I learned the moon, Earth and our sun makes a eclipse and I learn that the sun puts light on the moon and when the moon face to the Earth the moon blocks the Sun." (Well, sometimes.)

"I learn that the other halfe of the Earth night and other and the day the Halfe of the Earth and the day."

"I like the part where you needed to look up and look at the stars it was beautiful."

"I loved when you showed us the constellations in the movie room that was amazing. One more thing I learned so much that I want to go again."

You can't beat that. ☆

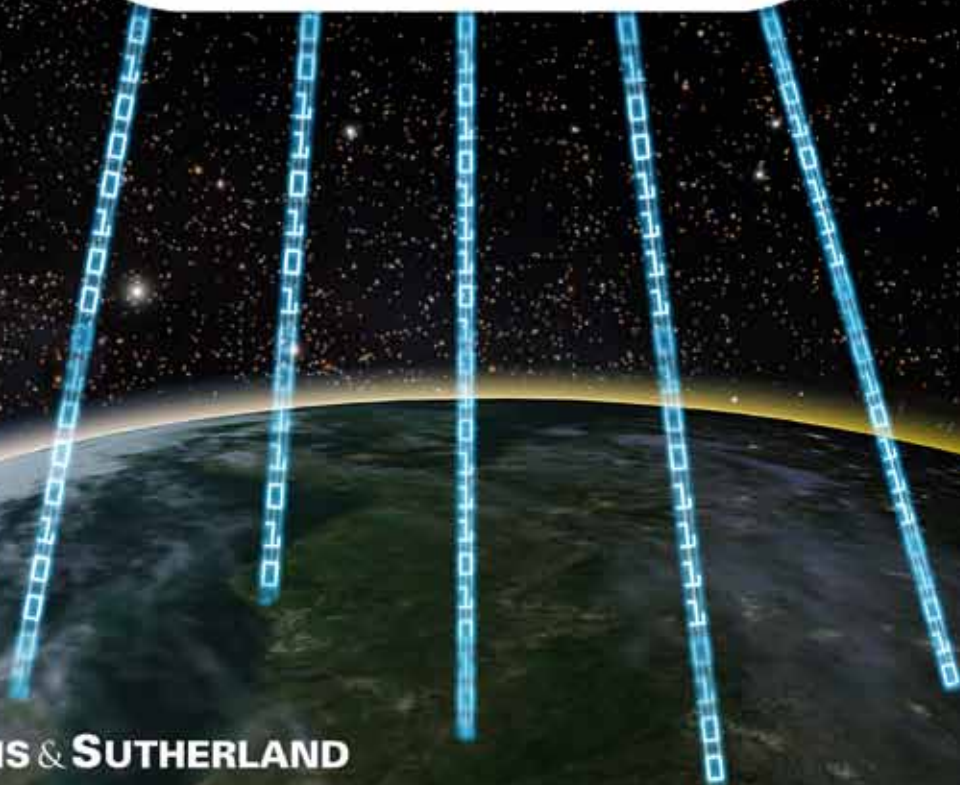


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