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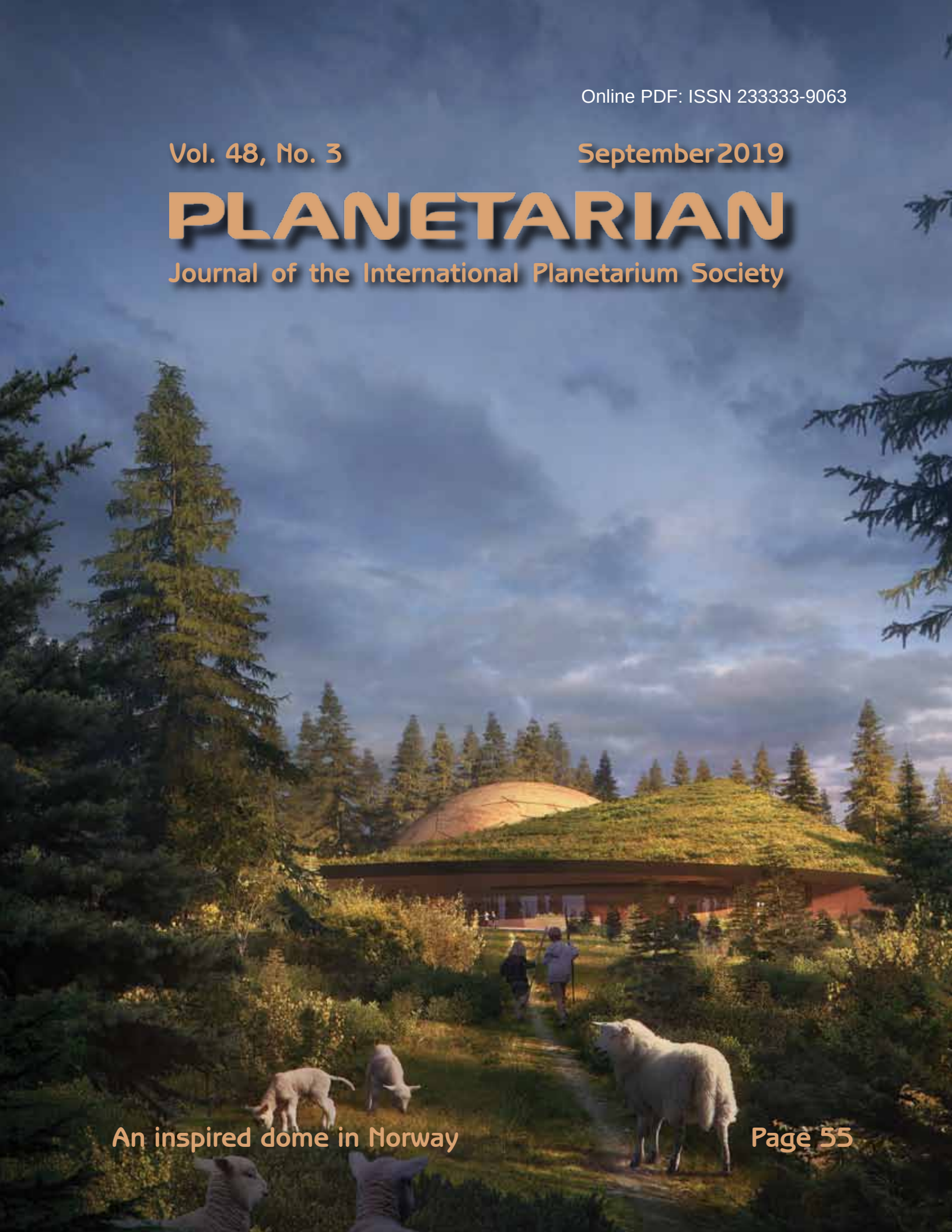
September 2019

# PLANETARIAN

Journal of the International Planetarium Society

An inspired dome in Norway

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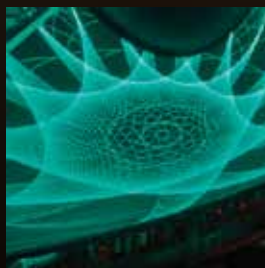


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#### Executive Editor

Sharon Shanks  
484 Canterbury Ln  
Boardman, Ohio 44512 USA  
+1 330-783-9341  
sharon.shanks@gmail.com

#### Webmaster

Alan Gould  
Lawrence Hall of Science Planetarium  
University of California  
Berkeley CA 94720-5200 USA  
adgould@comcast.net

#### Advertising Coordinator

Dale Smith  
(See Publications Committee on page 3)

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#### On the Cover

Artist's vision of the new planetarium and visitor's center for Solobservatorie, Norway's largest astronomical facility. Learn more on page 55. ©Snøhetta/Plompgozes; used with permission.

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### Don't miss these online features!

IPS has launched a means of communication, designed to keep you up to date between *Planetarian* issues and to make you aware of breaking issues. In other words, it's news that can't wait.



It's called *The Communicator* (a take on the iconic communicators used on *Star Trek*), and is sent to all IPS members via email.

Be sure to check out topics in the first three issues:

**July:** <https://www.ips-planetarium.org/page/072019IPSNewsletter>

**June:** <https://www.ips-planetarium.org/page/062019IPSNewsletter>

- New African Planetarium Society
  - A tactile book of South American eclipses
- July:** <https://www.ips-planetarium.org/page/072019IPSNewsletter>
- Toulouse conference proceedings available
  - Meet your new membership chair
- August:** <https://www.ips-planetarium.org/page/082019IPSNewsletter>
- Week in professional development exchange program expands to Germany
  - More adventures from our South American traveling planetarian

## Officers



**President**  
Mark SubbaRao

Adler Planetarium  
1300 South Lake Shore Drive  
Chicago, Illinois 60605 USA  
+1 312-294-0348  
[msubbarao@adlerplanetarium.org](mailto:msubbarao@adlerplanetarium.org)



**Last President**  
Shawn Laatsch

Emera Astronomy Center  
167 Rangeley Road  
Orono, Maine 04469 USA  
[shawn.laatsch@gmail.com](mailto:shawn.laatsch@gmail.com)



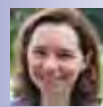
**President Elect**  
Kaoru Kimura

Japan Science Foundation/Science Museum  
2-1 Kitanomaru-koen, Chiyoda-ku,  
Tokyo, Japan 102-0091  
+81 3-3212-8506  
Fax: +81 3 3212 8443  
[kaoru13ican@gmail.com](mailto:kaoru13ican@gmail.com)



**Executive Secretary**  
Patty Seaton

Howard B. Owens Science Center  
9601 Greenbelt Road  
Lanham, Maryland 20706 USA  
+1 301-906-5990  
[pxts13@yahoo.com](mailto:pxts13@yahoo.com)



**Treasurer**  
Ann Bragg

Anderson Hancock Planetarium  
Marietta College  
215 Fifth Street  
Marietta, Ohio 45750 USA  
+1 740-376-4589  
[ann.bragg@marietta.edu](mailto:ann.bragg@marietta.edu)



**Director of Operations**  
Kristen Lepine Dos Santos

Managing Matters  
411 Richmond Street East, Suite 200  
Toronto, Ontario Canada M5A3S5  
[operations@ips-planetarium.org](mailto:operations@ips-planetarium.org)

Payments of membership fees and advertising invoices should be made to Ann Bragg

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## Affiliate Representatives



### African Planetarium Association

**APA**  
Susan Murabana Owen  
The Travelling Telescope's Nairobi  
Planetarium  
105 Riverside Lane off Riverside Drive  
Nairobi, Kenya  
+254 722 218 267  
smurabana@travellingtelescope.co.uk

### Association of Brazilian Planetariums

**ABP**  
Alexandre Cherman  
Planetário do Rio de Janeiro  
R. Vice-Governador  
Rubens Berardo, 100  
Rio de Janeiro RJ  
Brazil 22451-070  
+55 (21) 2088-0536 ext. 208  
alexandre.cherman@  
planetariodorio.com.br  
www.planetarios.org.br  
www.planetariodorio.com.br

### Association of Dutch-Speaking Planetariums

**PLANed**  
Jaap Vreeling  
Nova informatie centrum  
Science Park 904  
1098 XH Amsterdam  
+31 0 20 525 7480  
+31 0 20 525 7484 fax  
J.A.Vreeling@uva.nl  
www.astronomie.nl

### Association of French-Speaking Planetariums

**APLF**  
Milene Wëndling  
Université de Strasbourg  
Jardin des Sciences  
12 rue de l'Université  
Strasbourg F-67000 France  
+33 (0)3 68 85 05 32  
+33 (0)3 68 85 04 88 fax  
milene.wendling@unistra.fr  
www.aplf-planetariums.org

### Association of Mexican Planetariums

**AMPAC**  
Ignacio Castro Pinal  
Ave. San Bernabé, 723, Casa 7  
San Jerónimo Lídice, C.P. 10200  
México City, D.F. México  
+52 (55) 5500 0562  
+52 (55) 5500 0583 fax  
icastrop@hotmail.com

### Association of Spanish Planetariums

**ASP**  
Javier Armentia  
Planetario de Pamplona  
Sancho Ramirez, 2  
E-31008 Pamplona Navarra Spain  
+34 948 260 004  
+34 948 260 056  
+34 948 261 919 fax  
javarm@pamplonetario.org  
www.planetarios.org

### Australasian Planetarium Society

**APS**  
Shane Hengst  
University of New South Wales Physics  
UNSW Australia  
Sydney NSW 2052 Australia  
+61 (2) 9385 4053  
+61 (2) 9385 6060 fax  
s.hengst@unsw.edu.au  
www.aps-planetarium.org

### British Association of Planetaria

**BAP**  
Lee Pullen  
We The Curious  
One Millennium Square  
Bristol BS1 5DB  
United Kingdom  
+44 (0)117 9157 221  
lee.pullen@wethecurious.org  
www.planetaria.org.uk

### Canadian Association of Science Centres

**CASC**  
Frank Florian  
TELUS World of Science  
11211 142 Street NW  
Edmonton, Alberta T5M 4A1 Canada  
fflorian@twose.ca  
www.canadiansciencecentres.ca

### Chinese Planetarium Society

**CPS**  
Jin Zhu  
Beijing Planetarium  
No. 138 Xizhimenwai Street  
Beijing, 100044  
P.R. China  
+86 10-5158-3311  
+86 10-5158-3312 fax  
jinzhu@bjp.org.cn

### European/ Mediterranean Planetarium Association

**EMP**  
Manos Kitsonas  
Eugenides Planetarium  
387 Syngrou Avenue  
17564 P. Faliro  
Athens, Greece  
+30 210 946 9674  
+30 210 9417372 fax  
mak@eugenfound.edu.gr

### Great Lakes Planetarium Association

**GLPA**  
Mike Smail  
Adler Planetarium  
1300 S Lake Shore Drive  
Chicago, Illinois 60612 USA  
+1 312-294-0365  
msmail@adlerplanetarium.org  
www.glpa.org

### Great Plains Planetarium Association

**GPPA**  
Jack L. Northrup  
Sci-Tech Instructional Facilitator  
Omaha, Nebraska USA  
jlnorthrup@fbx.com

### Italian Association of Planetaria

**IAP**  
Loris Ramponi  
National Archive of Planetaria  
c/o Centro Studi e Ricerche  
Serafino Zani  
via Bosca 24, C.P. 104  
I 25066 Lumezzane (Brescia) Italy  
+39 30 872 164  
+39 30 872 545 fax  
megrez58@gmail.com  
osservatorio@serafinozani.it  
www.planetari.org

### Japan Planetarium Association

**JPA**  
Sumito Hirota  
Kawasaki Science Museum  
7-1-2 Masugata, Tama-ku  
Kawasaki, Kanagawa  
214-0032 Japan  
hirota@e23.jp  
planetarium.jp

### Middle Atlantic Planetarium Society

**MAPS**  
April Whitt  
Jim Cherry Memorial Planetarium  
Fernbank Science Center  
Atlanta, Georgia 30307 USA  
april.whitt@dekalbschoolsga.org  
www.mapsplanetarium.org

### Nordic Planetarium Association

**NPA**  
Aase Roland Jacobsen  
The Science Museums  
C.F. Moellers Alle 2  
University of Aarhus  
DK-8000 Aarhus C  
Denmark  
+45 87 15 54 15  
aase.jacobsen@sm.au.dk

### Pacific Planetarium Association

**PPA**  
Benjamin Mendelsohn  
West Valley Community College  
14000 Fruitvale Avenue  
Saratoga, California  
95070-5698 USA  
+1 408-741-4018  
+1 408-741-4072 fax  
Benjamin.Mendelsohn@wvm.edu  
sites.csn.edu/planetarium/PPA

### Rocky Mountain Planetarium Association

**RMPA**  
Michele Wistisen  
Casper Planetarium  
904 North Poplar Street  
Casper, Wyoming  
82601 USA  
+1 307-577-0310  
michele\_wistisen@natronaschools.org

### Russian Planetariums Association

**RPA**  
Yaroslav Gubchenko  
Fulldome Film Society  
PO Box 103  
60310 Nizhny Novgorod, Russia  
gubchenko@fulldomefilm.org  
www.apr.planetariums.ru

### Society of the German-Speaking Planetariums

**GDP**  
Björn Voss  
LWL-Museum für Naturkunde  
Westphalian State Museum  
of Natural History  
Sentruper Str. 285  
48161 Münster Germany  
+49-251-591-6026  
+49-251-591-6098 fax  
bjoern.voss@lwl.org  
www.gdp-planetarium.org

### Southeastern Planetarium Association

**SEPA**  
John Hare  
Ash Enterprises  
29 Riverside Drive, Apt 402  
Cocoa, Florida 32922 USA  
+1 941 730 3434  
johnhare@earthlink.net  
www.sepadomes.org

### Southwestern Association of Planetariums

**SWAP**  
Sarah Twidel  
Noble Planetarium  
Fort Worth Museum of Science and History  
1600 Gendy Street  
Fort Worth, Texas 76107 USA  
(817) 255 - 9409  
stwidal@fwmslh.org  
www.swapskies.org

## Awards

Manos Kitsonas, Chair  
Eugenides Planetarium  
387 Syngrou Avenue  
17564 P. Faliro  
Athens, Greece  
+30 210 946 9674  
+30 210 941 7372 fax  
mak@eugenfound.edu.gr

## Conference

Current Officers  
Upcoming conference host, past conference host, any IPS member appointed by the president

## Conference Host-2020

Alan Nursall, President and CEO  
Frank Florian, Director, Planetarium and Space Sciences  
Cathy Barton, Executive Assistant  
11211-142 Street NW  
Edmonton, Alberta, Canada T5M 4A1  
anursall@twose.ca  
fflorian@twose.ca  
cbarton@twose.ca

## Standing Committees

### Elections

Martin George, Chair  
Launceston Planetarium  
Queen Victoria Museum  
Wellington Street  
Launceston Tasmania 7250  
Australia  
+61 3 6323 3777  
+61 3 6323 3776 fax  
Martin.George@qvmag.tas.gov.au

### Equity, Diversity and Inclusion

Karla Peregrina, Chair  
Cancun Planetarium Ka' Yok'  
Consejo Quintanarroense de Ciencia y Tecnología  
Av. Palenque s/n S.M.21Mz. 5 CP 77505  
Cancún, Quintana Roo, México  
+1 52 (998) 883 95 57  
+1 52 (998) 201 15 18

### Finance

Current Officers

### Membership

Mike Murray, Chair  
Delta College Planetarium  
100 Center Avenue  
Bay City, Michigan 48708 USA  
+1 989-667-2270  
mikemurray@delta.edu

### Publications

Dale W. Smith, Chair  
BGSU Planetarium  
104 Overman Hall  
Physics & Astronomy Department  
Bowling Green State University  
Bowling Green, Ohio 43403 USA  
+1 419-372-8666  
+1 419-372-9938 fax  
dwsmith@bgsu.edu

## IPS Permanent Mailing Address

International Planetarium Society  
c/o Ann Bragg, Treasurer  
Marietta College  
215 Fifth Street  
Marietta, Ohio 45750 USA

IPS Web Site:  
www.ips-planetarium.org

Contact the Treasurer for individual member address changes and general circulation and billing questions. Addresses also may be changed online on the IPS Web Site.

## Professional Partners



## Ad Hoc Committees/Task Forces/Working Groups

### Armand Spitz

Planetarium Education Fund  
Finance Committee

### Education

Jeanne E. Bishop  
Planetarium Director  
Parkside Administration Building  
24525 Hilliard Road  
Westlake, Ohio 44145 USA  
+1 440-871-5293  
+1 440-835-5572 fax  
jeanneebishop@wowway.com  
www.glpaweb.org  
Mail address:  
3180 Oakwood Lane  
Westlake, Ohio 44145 USA

### Emerging Communities

Dave Weinrich  
5250 State Road 35 S  
Nelson, Wisconsin 54756 USA  
dave.l.weinrich@gmail.com

### History

John Hare, IPS Historian  
Ash Enterprises  
29 Riverside Drive, Apt 402  
Cocoa, Florida 32922 USA  
+1 941 730 3434  
johnhare@earthlink.net

### Immersive Audio

Charles Morrow  
1961 Roaring Brook Road  
Barton, Vermont 05822 USA  
Phone: +1-212-989-2400  
cm@cmorrow.com

### International Relations

Martin George, Chair  
Launceston Planetarium  
Queen Victoria Museum  
Wellington Street  
Launceston, Tasmania 7250  
Australia  
+61 3 6323 3777  
+61 3 6323 3776 fax  
Martin.George@qvmag.tas.gov.au

### Planetarium Centennial Task Force

Björn Voss  
LWL-Museum für Naturkunde  
Westphalian State Museum Of Natural History  
Sentruper Str. 285  
48161 Münster, Germany  
+49-251-591-6026  
+49-251-591-6098 fax  
bjorn.voss@lwl.org

### Planetarium Design and Operations

Ian McLennan  
#404-1275 Haro Street  
Vancouver, British Columbia  
V6E 1G1 Canada  
+1 604-681-4790 phone + fax  
ian@ianmclennan.com  
ian.mclennan@gmail.com  
www.ianmclennan.com

### Portable Planetariums

Susan Reynolds Button, Chair  
Quarks to Clusters  
8793 Horseshoe Lane  
Chittenango, New York 13037  
+1 315-687-5371  
sbuttonq2c@twcny.rr.com  
sbuttonq2c@gmail.com

### Science & Data Visualization Task Force

Mark Subbarao  
Adler Planetarium  
1300 South Lake Shore Drive  
Chicago, Illinois 60605 USA  
+1 312-294-0348  
msubbarao@adlerplanetarium.org

### Vision 2020 Initiative

Jon Elvert, Chair  
Baton Rouge, Louisiana  
70802 USA  
jelvert1@gmail.com

We are gathered together from all corners of this globe, inspired by the world and the universe we inhabit. Our society draws its strength from our predecessors and from the wide diversity of our present membership. Building on our past heritage, we are inspired to dream of future accomplishments, working together as a worldwide society.

IPS President Dave Weinrich  
Welcome to the 2012  
IPS Conference  
Baton Rouge, Louisiana

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- Research articles dealing with educational aspects of the planetarium and other topics are highly desirable and will be referred

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### Changes: Some big, some small

You'll notice some changes as soon as you open this issue of *Plan-  
etarian*. I felt that the contents page  
was becoming too crowded, and  
also have wanted for a long time to  
make the monthly columns easier to  
find.

The solution: make the contents  
span two pages. I hope you like  
finding out the titles of the columns  
and the additional details before  
turning to those pages.

Also pay attention to the "Don't  
miss these online features!" box on  
page 2. I hope you've been getting  
the *IPS Communicator* in your email for the past three months. It gives  
us the chance to share news with you that either can't wait for the next  
*Plan-  
etarian* issue or is vital enough to share immediately.

It also will contain stories that normally would be printed in these  
pages, but are not. It's web-only content that you do not want to miss!

Another small change (brought about by an anticipated big change)  
is on the Affiliate Representatives page.

Congratulations to Susan Murbana Owen, the first representative for  
the brand new African Planetarium Association. It is always an extreme  
pleasure to add another affiliate to the ranks of IPS, of course, but it  
created a headache for me in terms of layout. I nudged and tweaked,  
resized pictures and text, and just couldn't get it to flow nicely. My  
solution is on page 3.

Before readers need a magnifying glass to see the page, I promise I  
will expand it, too, to two pages.

Speaking of expanding: that is coming very soon.

Thanks to IPS voters who approved changes to the by-laws and the  
hard work of the Vision2020 initiative, the governing structure of IPS  
is adding another layer, that of a board of directors, that is hoped to  
streamline and improve communication and how our organization  
functions.

The first candidates for the nine board seats share information about  
themselves and why they would like to represent their geographical  
regions starting on page 14.

### Imagining the future of the planetarium

Micky Remann sees big changes ahead for the planetarium dome in  
his guest editorial on page 10. I asked him to share his vision of the next  
100 years of the planetarium as part of the upcoming celebration of the  
first 100 years. Keep his visions in mind as you read the September 2119  
issue of *Plan-  
etarian*.

Another visionary, Ralph Heinsohn (in a story also written by Aase  
Roland Jacobsen and Carsten Skovgaard Andersen), shares how he



My tribute to *Hidden Figures*: the original cover of the book; the cover after the *Hidden Figures* movie was released;  
the version for younger readers; and Katherine Johnson's autobiography, also for younger readers and just released.

opened a dome up to non-astronomy content as part of the Nordic  
Film Days Lübeck and discovered a new audience eager for immersive  
media. This collaboration also led to the discovery of a rare star projec-  
tor that was built in his home town.

Huntsville, Alabama, is known widely by its nickname of "Rocket  
City." The place in Rocket City with the rockets is the U.S. Space and  
Rocket Center which, until recently, was lacking only a planetarium to  
be the perfect space-related facility. (That is my opinion only, formed  
after visiting there several years ago. I still have my glow-in-the-dark  
socks from the gift shop.)

You can imagine, then, that I was overjoyed to learn that its IMAX  
theater has been transformed into a planetarium dome. Judith Rubin,  
who keeps us up to date on the industry side of our profession, tells us  
about all the cutting-edge equipment the new INTUITIVE© Planetari-  
um has to offer. Go to page 32 to start reading.

### Influences from the past, influences in the future

Both Jeanne Bishop (page 50) and Tom Callen (page 70) reflect on  
people and legacies in their columns. Jeanne remembers famous people  
she has met<sup>1</sup> and how they influenced her, while Tom, seeking a plane-  
tarian's legacy, wonders about permanence and all the people that we,  
as planetarians, have touched.

I am pleased to welcome former Editor Jordan D. Marché II back to  
the pages of *Plan-  
etarian*. He uses his extensive knowledge about plan-  
etariums to review the book *The American Museum of Natural History  
and How It Got That Way* on page 76.

Finally, I dusted off my reporter's notebook and enjoyed a trip to  
Fairmont, West Virginia, located an easy drive south of Youngstown,  
Ohio. I have been following news about Katherine Johnson since  
reading the book *Hidden Figures*, and was thrilled to see another recog-  
nition of her by NASA, this time by renaming the Independent Verifi-  
cation and Validation Facility in Fairmont in her honor.

One of the highlights of the experience was not the politicians or  
NASA officials; it was meeting Roy Lee Cooke, another West Virginian  
and one of the original Rocket Boys from Coalwood. ☆

<sup>1</sup>For the sake of transparency, I must admit that I used my prior association with  
Ted Pedas, his family, and his cruise enterprise to find and get permission to use  
the photo that appears on page 51.

Sharon Shanks has been *Plan-  
etarian* editor since Vol. 35 No. 3 (Septem-  
ber 2006). She retired in 2015 from the Ward Beecher Planetarium at  
Youngstown State University in Ohio, returning to her journalism roots  
after a pleasantly passionate career sharing the stars.



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Mark SubbaRao  
Adler Planetarium  
1300 South Lake Shore Drive  
Chicago, Illinois 60605 USA  
+1 312-294-0348  
msubbarao@adlerplanetarium.org

### To promote and advance

I like to think about the activities of IPS as roughly falling into two categories: We work to **promote** planetariums both on a collective and an individual level. We also work to **advance** the planetarium, improving the state of the art of planetarium programming, and investigating new uses for our nearly century-old immersive theaters.

The last few months have been busy for me, including trips to Africa and Europe. I will write this month's President's Message in the form of a diary/travel journal. The purpose is to illustrate some of the ways that IPS is working to promote and advance the planetarium field.

**May 13, Paris France:** I gave a keynote presentation titled "Data to Dome" at the iVOA Interop meeting at the Paris Observatory. The iVOA is the International Virtual Observatory Alliance and is the group entrusted with setting the data standards for the astronomical community. The goal of my talk was to inform this community of the progress our community has been making on data standards, such as data2dome, and to push for greater coordination between the planetarium and research astronomy community. Many thanks to Chenzhou Cui from the Chinese Virtual Observatory for helping to arrange this presentation.

**May 21-25, Accra Ghana:** Here I met with Jacob and Jane Ashong and the rest of the Ghana Planetarium staff. After a decade of collaboration (the Adler planetarium and the Ghana Planetarium were partners in the ATSC twinning program during the International Year of Astronomy in 2009, and the Ghana Planetarium is a regular participant in the Kavli Domecasts), I was finally able to visit in person. One thing that made the visit extra special was that my wife, Amanda, was able to accompany me as well. She served in the US Peace Corp in Ghana 30 years ago and this was her first time back.

**May 25:** International Astronomical Union's President Ewine van Dishoeck visited the Ghana Planetarium as well, giving a presentation under the dome. At the event were Chief Bortei-Doku of Nungua, Ron Strikker, the ambassador of the Netherlands in Ghana, and many other dignitaries. There were also students from a local astronomy club, as well as students from the Development in Africa with Radio Astronomy program who had just finished training at the radio telescope in Kuntunse.

### Exciting visit to Principe

**May 26-30, Príncipe:** May 29 was the 100th anniversary of the Eddington Experiment. By measuring the deflection of stars in the Hyades during a total solar eclipse that passed over this small island, Arthur Stanley Eddington confirmed Einstein's predictions. This was arguably the most important scientific experiment of the last 100 years.

To celebrate a week-long event called Eddington@Sundy was held.

Roça Sundy, the former cocoa plantation where Eddington performed his experiment, today is a high end resort, owned by "space tourist" Mark Shuttleworth. During Eddington@Sundy I had the opportunity to give the presentation "100 years of the Planetarium." During that presentation I pressed the case for the development of more planetariums in Africa, and in particular one in Príncipe.

Later at a dinner, and with the assistance of Rosa Doran, I had an excellent conversation with Prime Minister of São Tomé and Príncipe Jorge Bom Jesus, and the governor of the autonomous region of Príncipe, António José Cassandra. One hundred years after the Eddington Experiment they want the islands to become a laboratory for science education and science tourism. We

talked about the role that a planetarium could play in realizing that vision. At the celebration event on the anniversary, a small science museum was dedicated and plans to add a planetarium to that space were announced as well.

**May 31-June 2, Accra Ghana:** On the way back home from Príncipe we stopped in Accra again. As many of you know, the Ghana Planetarium, the first digital planetarium in Africa, has been struggling to survive. There is now an exciting possibility to build a new Ghana Planetarium in coordination with the University of Ghana Legon on the grounds of the Legon Botanical Gardens.

This location receives many more visitors, and a planetarium there would be able to serve both the hundred thousand visitors who come to the gardens as well as university students studying physics and astronomy. During this visit we met with the director of the gardens, Kofi Boakye-Yiadom, and Professor Robert Kingsford-Adaboh, the acting dean of the School of Physical and Mathematical Sciences at the University of Ghana Legon.

**June 22-23 Reykjavik Iceland:** The IPS Council meeting was held in Reykjavik. This was the last council meeting before we transition to our new governance model. At this meeting we had updates on the activities of the various committees and regional affiliates. We also initiated a plan for finishing the work of Vision 2020 by the time of the 2020 conference meeting in Edmonton. It was also at this meeting that the council selected St. Petersburg as the site of the 2022 IPS conference.

Our host for this meeting was the spectacular new Perlan: Wonders

*(Continues on page 19)*



A visit to Ghana: From left, me, my wife Amanda, Jane Ashong, Jacob Ashong, and staff member Silver Bombay. I provided the photo.

IPS President Mark SubbaRao, among his many associations, also is the director of the Space Visualization Laboratory at the Adler Planetarium.

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# The Planetarium: A chronicle of the next 100 years



Micky Remann  
Professor for Immersive Media  
Bauhaus-Universität Weimar  
Weimar, Germany

### The year is 2025

When the Rolling Stones announced the release of their new album, *PlanET*, only 60 years after their hit “Satisfaction” had excited youth of the day, the news caused a predictable stir in and beyond the entertainment world.

The big surprise was not so much the music, but the location where it was presented: on the small South Atlantic island of St. Helena. The semi-eternal Rolling Stones were to perform their new songs in a super exclusive live concert within a floating 190-foot, LED-lined dome with spectacular 360-degree visuals and spatial audio effects. The dome was built and installed specially for the occasion on a platform off the harbor of Jamestown, St. Helena’s main city.

Local authorities had given permission to the event under the condition that the number of people from abroad would be no more than the number of regular dwellers in Jamestown, which was 629. Culling a guest list to that limit was a nightmare for the Stones’ management and caused irritation, bad feelings, even curses, from eager fans and celebrities who found themselves excluded. As the crisis worsened, someone came up with the idea to call planetariums around the world to persuade them to stream the 360-degree live event in their established dome theatres.

Tickets were sold out within minutes after the news broke that the Rolling Stones’ *PlanET* concert could also be watched in satellite shows in the planetariums of San Francisco, Jena, Beijing, London, Moscow, Rio de Janeiro, Berlin, Denver, Hamburg, New York, and Cape Town. A couple of rogue VR platforms bootlegged the event and made it available to what they called the “Immersive Underground” for a small Bitcoin donation.

On August 9, 2025, under a full moon, the real Rolling Stones dressed in fantasy astronaut-theme suits, entered the stage in front of the 629 chosen few at the St. Helena Dome, and received ecstatic cheers there and from hundreds of millions of additional fans around the world observing their holographic equals before them on virtual planetarium stages as 3D avatars.

Addressing the remote hive audiences, Mick

Jagger said “We call our album *PlanET* because we think it’s time to look around and see who’s in our cosmic neighborhood, and if they will join in on our songs. Or vice versa.” He went on to explain why St. Helena was the perfect place to do so, quoting author Edward O. Wilson, who had once described that this lonely island as “one step removed from a satellite colony in space.”

With the opening of the gigantic MSG Sphere at the Venetian in Las Vegas in 2021 and the Rolling Stones *PlanET* show in the St. Helena Dome in 2025, a major trend was set and immersive dome theatre shows became mainstream. Extraordinary theatre and opera performances migrated from their traditional venues to the new 360-degree, high-performance multimedia domes that popped up and flourished everywhere, the most prominent being the La Scala Opera Sphere in Milan.

The success of these shows superseded most of the programming in



An exterior rendering of MSG Sphere at The Venetian in Las Vegas. The state-of-the-art venue will be 366-ft tall and 516-ft wide. Courtesy: The Madison Square Garden Company

conventional planetariums, much to the dismay of disgruntled science teachers who felt that the classic mission of the planetarium was in danger of being corrupted by too much pop and popcorn and that something had to be done about it.

## 2027

After years of tiresome meetings and fruitless brainstorming sessions, an idea was put forward to the international planetarium community, which eventually ignited a new interest in the core domain and mission of these venues. The turning point came on March 20, 2027 at 20:51 GMT, when the first edition of One Earth Moment was launched. The project was based on a manifesto-like call for action that had been circulated for some time. This is what it said:

20 March 2027

24-hour Equinox Domecast

Worldwide ... at a Planetarium near you!

Speckled around the globe are domes and planetariums. Some are grand, some are small, and many have a lot in common, but mostly these planetariums operate disconnected from each other.

What if leading planetariums team up to highlight a network of insight and inspiration? A global web of venues with amazing shows to share, and true stories to tell?

The 24-hour Equinox Domecast could be that precious One Earth Moment: that migrating instance of balance when the sun crosses the plane of the Earth's equator, shaping night and day to be equally long, regardless of where on Earth it is observed.

Staging an equinox celebration across all borders and time zones is an opportunity for planetariums to emphasize their mission, at the same time promoting their potential with the use of new immersive technologies. The experiences they offer are stunning, unique and specific to dome theatres, which are not available elsewhere.

The equinox itself has long been occurring. Its steady tempo reminds us of the dynamic rhythm of our planet and its place among the cosmos.

One Earth Moment would be a simultaneous performance of immersive programming at a circuit of domes sharing media coverage around the world. The event will be run by people who care and communicate about relevant issues in science, innovation, art, and life on earth.

At each location the program starts 12 hours before and ends 12 hours after the true equinox. Venues will host combined programming of live performance and streaming of activities from other planetariums. Some programming will address local audiences, some will be shared and broadcast among all.

Themes presented during the equinox event will be both popular and instructive. Themes will introduce another level of attraction for venues to participate: realtime dome-to-dome interactivity.

Additionally, leveraging cross-collateral media support would mean that each dome multiplies the effort that all others make to promote it to local clientele, sponsors and media. Joining forces in smart networks, One Earth Moment teams will be able to prepare a rich program, excite the media, get the attention of celebrities and lure audiences into the dome that had little or misleading ideas...or no idea at all of what these places are about.

With high resolution immersive 360-degree display systems now established in leading planetariums, it's an exciting time to showcase how entertaining the alternation of astronomy with avant-garde art and other engaging programming is. The dome theatre is the place to witness the paradigm shift from the flat, rectangular screen to a world of immersive, interactive, surrounding media experiences. This shift is not only redefining contemporary media art, live performance, and science education, but also offers a chance to redefine the mindset in which we, the human race, perceive our place on this global sphere, and how we may engage to shape its landscape.

If the time for One Earth Moment has come, it will be big. Regarding their potential, planetariums and domes (and what's possible inside them) is still underrated and under-promoted, and this project embarks to match their capability. This endeavor would need a critical number of leaders willing to move beyond the stand-alone existence of their domes, for this committed circuit to engage, connect, and act as one vibrant, shining web of venues.

The success of the inaugural One Earth Moment prompted follow-ups. Equinox celebrations were held twice a year, involving more and more planetariums, institutions, media, universities, technologists,

artists and free thinkers—including the crew tuning-in from the International Space Station, as regulars. Planetariums were back in business like never before and science was celebrated among entertainment in peaceful co-existence.

## 2032

Planetarium operators realized there was one key obstacle for true customer satisfaction that had never been properly addressed with regards to the specifics of their venues: seating! Be it chairs, sofas, yoga mats or bean bags, too many people still left the dome with a stiff neck or worse complaints, despite how awesome fulldome shows dazzle audiences in visual splendor.

In another development, the burgeoning spa industry, in its quest to create new relaxation thrills for their high-income clientele, came to the conclusion that deep relaxation in thermals baths would best work when combined with deep immersive visuals surrounding people in the pool.

When the first immersive Planetarium Spa with underwater sound and a 360-degree display cupola opened in a remote little spa town in East Germany, enthused bathers couldn't believe it took so long to realize how obvious this was: Immersion, derived from the Latin word for diving-in, clearly pointed to water as the natural medium for immersive experiences! Chairs were no longer in the way, when one could float in and out of the 360-degree audiovisual compositions, reclined, with ease. Immersed in body-temperature saltwater, formerly burdened bodies were transformed into weightless dolphins or astronauts; high quality underwater sound was perceived dreamlike and crystal-clear, with ears submerged.

Floating effortlessly on the back, the eyes can be closed or open looking up to watch enticing visuals in the dome, which perfectly filled the field of view of a human suspended in water. People came and went to soak blissfully below jaw-dropping fulldome shows, with pristine 128k resolution and 480 fps frame rate.

## 2047

A relevant new arrival on the scene came with a startup originating in Gotenburg, Sweden, who designed the Venus Transit Domes, soon to be franchised in many countries around the world. The Venus Transit Domes used inflatable LED display units with rubbery skin, which could be flexibly scaled from a 3-meter minimum to 28-meter maximum diameter—the actual size being regulated by air pressure driven by artificial intelligence (AI). The 360-degree display would grow and shrink according to needs, thus always matching the number of people who came to see the show: mobile, modular, morphing venues.

Presentations in the Venus Transit Domes invariably started with a scholarly discourse on the science of Venus transits and how astronomers in the past had observed them. Since space travel takes time, even for planets like Venus, it wouldn't be until December 11 of 2117 before the next transit would be due. "So what do we do in the meantime," the announcer's voice asked, "here are some suggestions you might want to consider..." The programming that followed was described by people who watched it as either stimulating, sensual, controversial, notorious, revolting, bizarre, or outright pornographic. Before the economy crashed, Venus Transit Domes Inc., also nicknamed "Red Light Domes," had been ranked high up in the list of the fastest growing Fortune 500 companies.

## 2098

Recovery from the crash was slow and painful. When a more optimistic outlook became fashionable again, a colorful consortium of companies formed out of the remnants of the space industry. Planetar-

*(Continues on next page)*

iums and the Rolling Stones teamed up again to launch the Space Allosphere, a true and full spherical venue hovering high above this rock, in near-outer Earth's orbit. It was serviced with regular shuttles from Singapore, Melbourne, Ulan Bator, Prague, and Rio de Janeiro.

The Allosphere was a solid, 58-meter entertainment sphere attached to the New International Space Station. The total absence of anything resembling chairs inside the sphere was seen as a great relief, since the audience was floating around freely in weightlessness: moving back and forth, up and down within the full spherical content display, and around intermingling holograms.

Ushers were adorned in uniforms with aparati which appear to be similar to children's floating devices of the early 2010's for soft protection while maneuvering the space. It became mandatory they train to cater to those few spherical theater go-ers who suffer from "Allosphere sickness." The functionally designed ASB (Allosphere Sickness Bags) were the most sought-after trophies for space tourists to bring back home to Earth and proudly show-off to envious friends and family.

Pioneering the concept for the Allosphere Space Theatre, Kelley Francis, a long time professional designer of "immersivistas," as such environments were called in the industry, had mapped out the guidelines for the genre of interactive zero-gravity immersive art installations shows:

*A small array of mechanical characters powered by remote micro-controllers tend to the living fauna about the theatre, also contributing to oxygenating the hovering entertainment space and monitoring humidity. These mechanical beings taught and tempt the plants to release scent in tandem with creative programming of the content, contributing to the full multisensory experience which subdues the audience into varied moods and states while engaged with the entertainment.*

*Similar technology to what these intelligent bots use to cultivate the nasal landscape is embedded in the costume of the audience members. Various wearable devices cause various effects. Most are programmed to their special liking to emit smells, vibrations, and neuro-pulses when triggered by the interactive theater. Some audience members even embed devices that interact directly with their nervous system. These provoke sensation, feelings of euphoria, fear (when desired for horror experiences), or simply record the show to hard-wired (technologically modified) memory, to call upon and enjoy spherical picture moments later.*

*Visually, audience members appear to each other with overlaid avatars of their choosing. Picture your friend Sarah, with semi-transparent holographic armor in glistening purple with long blue hair and adornment of her design. Perhaps before the event she's designed her avatar to project large blue wings around her, or a long spiny red tail. She and the other audience members suspended in this piece have a shifting pixelated landscape of fiction churning around them, as they interact with actors and each-other to connect, explore, and enjoy this physical/virtual mecca of interactive storytelling, in all its chaos and suspension.*

*Allosphere has taken the interactivity from major themed attractions of the late 2000's and equipped the audience with similar interactivity, but suspended them within this fully spherical, weightless pixel environment. They've pre-programmed embedded technology to craft costume to become one with the production, or to simply float along as passive plot bystanders in augmented style. Since the narrators built this experience as a storyworld, rather than a rigid single plot line, there are endless fictional storylines for the floating movie-goers to explore, driven as much by the audience as they choose to partake. And partake in again and again, with fresh and compelling outcomes.*

## 2109

Dometown was the label for huge, sphere-covered habitats that

were now home to most of humanity. Surprisingly, life inside the meta structures of Dometown was very close to what a media art and design student, Yikun Liu, had envisioned it in his master thesis at the Immersive Media department of Bauhaus Universität Weimar back in the year 2019. In Yikun Liu's predominantly dystopian vision, gigantic domes would be constructed to span across houses, cities, landscapes, creating a mostly virtual reality inside, separated from the mostly uninhabitable outside world.

"Now, imagine larger fulldome theatres are getting more common in the future," Yikun Liu proposed. "It could eventually accommodate a huge amount of people, becoming a quasi-leisure square, shopping mall, walking street, a small residential neighborhood, and a whole lot of other possibilities. At some point, people wouldn't need to leave it." The idea of a 'Dometown' has thus come to mind.

'RealCosmos Inc.' is the company responsible for simulating and alternating day and night. They've grown to control the massive city-wide domes covering contemporary towns, and go so far as to govern starlight and sunshine. An artificial sun offers proposed necessary light by day and peaceful, calming pale lights dapple the dome with moon and stars by pre-determined night. Therefore, an exact time of sunrise and sunset can be set and told.

"Since the city-wide domes cover a great deal of physical and visual real estate, they also project various useful information and government news such as time of day (or night) and announcements. Previously projections didn't go without the occasional word or slogans from sponsors, until the formation and implementation of the "Sky Purity Act," prohibiting this space for third-party advertisements and signage.

Special occasions like Christmas and New Years celebrate virtual fireworks city-wide for all to adore and enjoy."

## 2119

The editorial of the September 2119 issue of *Planetarian* is looking back at what had been said about the possible future of planetariums in a special guest editorial 100 years earlier: "Some of the scenarios our predecessors published in this magazine a hundred years ago," the editors concluded, "came pretty close to actual developments...others were strikingly inaccurate—except for this one guest story, which, as we all know by now, turned out to be one-hundred percent true."

*The author wishes to thank Kelley Francis for helping with editing, style and the cultural direction of the "Allosphere Space Theatre."* ☆  
*Thanks Yikun Liu for inventing "Dometown."*

Micky Remann is a German-born media artist and producer of media events. He is professor for Immersive Media at the Bauhaus-Universität Weimar, where he has been teaching the art of fulldome since 2007. In the same year, Micky Remann initiated the FullDome Festival at the Zeiss-Planetarium Jena, which he continues to direct until today. The international festival showcases and awards innovative productions in the genre of 360-degree audio-visual media and fulldome theatre performance.

As the inventor of "Liquid Sound," Micky Remann is also connected to another experience of immersion: floating in body temperature salt water, immersed in underwater sounds, lights and video images. The concept and media technology of "Liquid Sound" is installed in three major Spa venues in Germany, operated by Toskanaworld, where it has become the key attraction, featuring regular underwater live concerts, DJ nights, and an annual all-night Liquid Sound Festival.

As a travelling author, Remann also published articles, books, and travelogues; he hosts TV-Dome shows with the network Salve.tv; and he presents at scientific conferences and performs at cultural events. One of his international media projects is the "Apolda World Bell Concert," which connects sounds and stories of bells from around the world with music via livestream.

Find out more at: [www.fulldome-festival.de](http://www.fulldome-festival.de); [www.liquidsound.com](http://www.liquidsound.com); [www.apoldabells.com](http://www.apoldabells.com); [www.salve.tv/tv/Salve/19734/Welcome-to-the-TV-Dome-Pedro-Zaz](http://www.salve.tv/tv/Salve/19734/Welcome-to-the-TV-Dome-Pedro-Zaz)



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# Statements from candidates for new board seats



Susan Murabana Owen

## **Susan Murabana Owen** **Region: Africa**

I am a planetarian and managing director of the Travelling Telescope.

I started using a digital, mobile planetarium in 2013 and since then children and adults in Kenya who had never experienced this virtual world have now experienced it. I have been to many schools and public spaces educating people about the wonders of our universe. So far we have reached thousands of students and hundreds of schools in Kenya and Tanzania and we are now in the process of completing our fixed dome in the heart of Nairobi.

I have recently been elected as the president of the newly-formed African Planetarium Association (APA), and through this one of my aims is to encourage content creation from Africa to share with the rest of the world.

One of the main points I want to emphasise is how science—and particularly astronomy and space science—can inform us about the current state of our planet, (the most obvious being satellite observations) and how, combined with engineering, it can lead to solutions and problem solving. We always have a section in our show where we talk about the Apollo 8 “Earthrise” photo and how this led to the environmentalism movement. To encourage this approach, we are building the frame of our new planetarium out of bamboo—a much greener alternative to the traditional, more energy intensive standard of steel.

I want to see more of the emerging communities taking up leadership roles across the world because there are a lot of interesting stories from these communities, which could help shape the future of the IPS.

Our planetarium was one of the main exhibits at the second United Nations Environment Assembly UNEA meeting in Nairobi, where we had head of states and other ministers visiting the planetarium. We had the director of UNEA, Dr. Mae Jemison (first African American female astronaut), Rakesh Sharmar (first Indian astronaut) and Mark SubbaRao talk about various topics related to climate change inside. We feel this had a great impact on all who came.

Nominated by: African Planetarium Association

## **Sumito Hirota** **Region: Asia**

I am honored to be nominated by the Japan Planetarium Association as a board member of IPS. This is a big chance for me to contribute for IPS and world planetarium community.

I have been working for planetariums since 1995, and have been a member of IPS since 1996. I have served as a representative of Japan Planetarium Association for IPS since 2017.

I studied physics at Tokyo Metropolitan University, and also completed a museum study course. My master’s degree in astronomy and science communication is from Open University of Japan.

My career in the planetarium started at Kohtoh Children’s Hall Planetarium, Tokyo in 1995 as a planetarium instructor. I moved to Discovery Park Yaizu Planetarium, Shizuoka in 1997, and worked there for 17 years from the time that it opened.

I have served as a curator of astronomy at Kawasaki Municipal Science Museum since 2014. Also, I am a member of the editorial staff of the Japan Council of Science Museums, and a member of steering committee of the Astronomical Consortium of Japan.

The main part of my work is live presentation. I make live shows every month. I am researching planetarium technology to make good use of its function and possibility for our shows.

As a planetarian of Asia, I think it is very important to make a network among Asian planetarians because there are many planetariums, but there are a few members of IPS. Furthermore, there are many different languages and different cultures in Asia. We don’t know about planetariums in another country, even if it is next to own country. Therefore, I think a growth in membership of IPS from Asia is one of the most important issues.

If I become a board member of IPS, I will cooperate with the officers and other board members for smooth management of IPS, and I will try to make a network within the Asian planetarium community. I believe that exchanges among Asian planetarians will be helpful for activities of planetarium in the world. I will do my best to make the planetarium community and IPS better.

Nominated by: Japan Planetarium Association

The new board structure will take effect with the first seating of the board, which will be in Edmonton at the 2020 IPS Conference.



Jin Zhu

## Jin Zhu Region: Asia

I became curator of Beijing Planetarium, as well as director of Beijing Ancient Observatory and chief editor of *Amateur Astronomer* magazine, in September 2002. During the past 17 years, I have been involved in different aspects of planetarium management, mainly on astronomy outreach, including lectures and public talks, astronomy clubs, organizing observation activities, planetarium shows, and exhibitions, etc. I introduced and promoted the Astronomy Olympiad in China since 2003.

In 2007, we set up the planetarium committee under the Chinese Associations of Natural Science Museums, and I have been the director of this committee since then. Currently, I am the chief scientist of Science Communication Center of Beijing Academy of Science and Technology, director of the popularization committee of the Chinese Astronomy Society, a member of IAU Committee for Small Body Nomenclature, and an IPS Council member.

The IPS members in Asia, especially in China, are not too numerous at this moment, and I'm trying my best, along with my colleagues, to increase the number of IPS members in the region as quickly as possible and serve the community with my all efforts.

Nominated by: Chinese Planetarium Society



Jiří Dušek

## Jiří Dušek Region: Europe

A miracle machine. This is what we call a digital planetarium. Justly, because after all it's an amazing audiovisual device, a virtual spaceship taking you to places that are very difficult to get to or even don't exist at all. But it's still a machine that needs its pilots and engineers. Somebody has to control it in front of the audience and someone else has to make and create its program.

I graduated from astrophysics with specialisation in carbon stars and earned my PhD degree from Masaryk University in Brno, Czech Republic. I've been working at the Brno Observatory and Planetarium since 1994. And I've been its director since 2008.

I'm an honorary member of the International Astronomical Union, a member of the Scientific Board of National Geographic Czech Republic, and also a member of the Senate of the Czech Republic, where I deal with scientific and technical activities. I've prepared two dozen shows for the Brno Planetarium and I've also written several astronomical books.

The IPS has given my professional life almost everything. The first conference I was able to attend was in Alexandria and it opened my eyes and inspired me to transform our planetarium. During my second conference in Baton Rouge, we definitely decided to install a digital projection system. And thanks to the conference in Warsaw, we started organizing the Full-dome Festival Brno.

But IPS hasn't been just a professional inspiration to me. I've met a lot of new friends I'm still cooperating with now. I even like to have a glass of beer or wine. Preferably red.

It would be a great honour for me to work for the

International Planetarium Society. I offer a view of this planet and the whole adjacent universe from Central Europe. Oh, and I like backpacking in Asian countries.

Nominated by: IPS member Tomáš Gráf (non-affiliate region)

## Kai Santavuori Region: Europe

I have put myself forward as a board candidate for the NPA, which supported the nomination, as I believe that I have much to contribute to the IPS organisation and its members.

I have been working in the planetarium business for over two decades. I have personally seen and experienced the tremendous progress that has taken place in the planetarium presentation technology and made it a success story.

I have been a member of IPS, NPA, and GSCA since 1997 and taken part in their conferences. For the last 5 years, I have also attended IMERSA summits. I am a member of Euromax and ICOM and have been an IPS Fellow since 2016.

I am currently working as a consultant in planetarium related matters around the world. Together with my customers I try to find the right tools for different types of projects. With the customers, I identify, for example, their equipment, seating, sound system and lighting needs, seeking solutions that serve the customers and their needs. I also provide assistance in planning the programme and with activities that support operations, such as exhibitions.

My job also involves helping the customer to choose shows. I oversee and manage translation of the shows into different languages, voice-overs and image and audio editing. Thanks to my wide circle of friends and networking, I have been able to design planetariums and help planetariums develop their operations and become more efficient.

Short CV:

1980-1997: Camera assistant, cameraman, sound engineer, director (short films, commercial films, etc.)

1997-2015: Planetarium manager, Heureka, the Finnish Science Centre, Helsinki, Finland

2015: Consulting, Scandinavian FullDome Agency & Sweco Structures LTD Finland

Projects:

- One of the largest planetariums in Scandinavia will be opened in the autumn of 2019. This planetarium, designed by me, is 18 metres in diameter and is located in the Kakslauttanen Arctic Resort in Finland.
- From 2006 to 2008 I worked as project manager for the theatre and planetarium renovation project at the Finnish Science Centre Heureka. The core idea was to discontinue the use of the 70-mm film projector and start using digital 360° fulldome technology. The project was executed according to plan and completed within the schedule and below budget.
- In 2011, my team and I initiated a new type of public lectures, using the fulldome planetarium system in a new way, taking the audience

The voting period will begin on October 1 and end on December 1.

All IPS members will vote within their own continental zones. The top people with the highest number of votes will be elected: first and second, depending on the number of board members within that zone.

Instructions on how to vote will be announced at the time of the election.



Björn Voss

to the very core of science. Images, sounds, and elements that titillated one's senses were combined with top science. The lectures from among Finnish researches were at the cutting edge of their field, and the topics ranged from studying the brain to expeditions, and from journeys into the space to genetic engineering.

- I organized the annual NPA (Nordic Planetarium Association) meeting in Helsinki September 2015 together with my partners, The University of Helsinki, Helsinki Observatory, Sky-Skan, Spitz, Goto and RSA Cosmos.

Nominated by: Nordic Planetarium Association

### **Björn Voss** **Region: Europe**

Let me introduce myself: my name is Björn Voss. I work at LWL-Planetarium in Münster, Germany. I have been active in the planetarium field for more than 20 years now, but I've only been employed at a planetarium as my "daytime job" since 2007. Before that, I worked as an astrophysicist at Kiel University (Germany) and briefly for ESA's GAIA project. During my time in Kiel, I was lucky to have the opportunity to create and present planetarium shows as a volunteer at Europe's first fulldome planetarium (Medien- und Planetarium Kiel).

Besides now running a planetarium, I am committed to cooperations between planetariums. My latest production, *The Planets*, was created in a group of 20 planetariums (and was lucky to win one of the awards at the IPS2018 fulldome festival).

I am one of the founding members of GDP, the Society of German-Speaking Planetariums, and I'm currently serving as GDP's president. I've worked with the IPS council for some years as GDP's affiliate representative. Also, I serve IPS as the chair of the new Centennial Working Group, preparing for the 100th anniversary of the planetarium.

Should you elect me to serve on IPS's board, I will stay in close contact with my fellow affiliate representatives, and with IPS members in countries that are not (yet?) served by an affiliate organization, to always represent your interests in the best way. Also, I will work with all affiliates to further increase IPS's membership throughout our region. I especially plan to explore opportunities to work together with you on Europe-wide planetarium projects, e.g. with organizations like ESO or ESA. Let's see how we can be stronger together!

Nominated by: Society of the German-Speaking Planetariums

### **Alexandre Cherman** **Region: Latin America**

My name is Alexandre Cherman. I am a Brazilian astronomer and I work at the Rio de Janeiro Planetarium. My original career goal was to become a researcher in cosmology (I have a Ph.D. in theoretical physics), but as I graduated from college, I started working at the Rio Planetarium as a "junior astron-

omer." Twenty-three years later, I am its director, responsible for this big institution, with three domes (two of which are digital, and the third one being a 23m dome, the largest in my country), a science museum, and the mission to bring astronomy to the largest public school system in Latin America.

My one and only job has been a planetarian. This is what I do. This is who I am.

As a planetarian, I have traveled the world (literally and figuratively). In fact, I have traveled to many different worlds (only figuratively, unfortunately). I have made many friends and I have learned many things. My involvement with IPS began rather early in my career. In 2002 I was attending my first IPS Conference in Wichita. And since then, I only missed a few of those conferences.

I was privileged to have attended the only IPS Conference in the southern hemisphere, in Melbourne. One year later, thanks to Susan Button's generosity, the Rio Planetarium hosted IPS' Council Meeting. This brought some light onto IPS, which made some Brazilian planetariums join. And that is how the Association of Brazilian Planetariums became an affiliate. (And I became a council member.)

I represented IPS during the IAU General Assembly of 2009. And just a year later, in Alexandria, I was nominated to run for president-elect. I did not get the position, but it was an honor and a privilege to run for office. Talking about privilege: in 2011, Rio de Janeiro bid for the 2014 Conference; we lost to Beijing. We bid again for the 2018 Conference, this time losing to Toulouse. Maybe the third time's the charm, like they say...

In 2012 I became a Fellow of IPS. And just the next year, I was elected president of the Association of Brazilian Planetariums (after serving six years as its scientific director). I currently serve as ABP's vice-president and editor-in-chief of its journal. I'm an IPS Council Member and an associated editor for its journal.

I'm very active in Brazil and I have strong ties to the neighboring countries, being a founding member of the Association of South American Planetariums (APAS). After being a presenter at V Festival Internacional de Planetarios (Mexico City, 2018), I have made many friends in Mexico. Having met my fellow planetarians from different parts of Latin America, I would be honored to put my experience and my personal network at their disposal, working together to make this part of the world thrive.

Nominated by Association of Brazilian Planetariums

### **Jean Creighton** **Region: North America**

I would like to work toward helping all planetariums reach as broad an audience as possible to inspire and teach. I am particularly interested in building collaborations among planetariums to share engaging content with emphasis on live interactions



Alexandre Cherman



Jean Creighton

Electronic voting will take place through the IPS Website: <https://www.ips-planetarium.org>



Levent Gurdemir



Benjamin Mendelsohn

with the audience. Many planetariums run on small budgets with 1-2 full time staff and could do more if they worked with other colleagues. I would like to continue professional development through webinars as well.

I grew up in Athens, Greece near the Eugenideíou Planetarium. I completed my graduate studies in astrophysics in Canada and I worked on an infrared satellite at the California Institute of Technology. In 1999, I moved to Milwaukee and taught astronomy at the University of Wisconsin-Milwaukee (UWM). I fell in love with planetarium programming in 2006 and was hired as the director of the Manfred Olson Planetarium at UWM in 2007. All our programs are live, making the most of our optomechanical projector and our in house productions.

I enjoy developing topics such as the "Birth of the Universe" and "Northern Lights." I also enjoy collaborating with people on campus and our community to create programs such *Indigenous Voices: Sharing Wisconsin Skies*. I have been active in the Great Lakes Planetarium Association (GLPA) as part of the Education Committee and as part of the team that created "Live from the Planetarium." I have contributed several articles to *Planetarium* on various topics, including Greek mythology and how best to teach people to identify constellations.

Nominated by: Great Lakes Planetarium Association

### Levent Gurdemir Region: North America

I am honored to receive a nomination for this brand new and very prestigious IPS position. I truly think that IPS will be a stronger organization with its new governance structure introducing new board members and officers. As an active member of the Vision 2020 Initiative, I enjoyed helping to shape this new governance structure over the past year.

I started my planetarium career in 2006 when I was a graduate student at the University of Texas at Arlington by running the university's smaller planetarium for astronomy labs. In 2008, I became the director of the university's newer and bigger planetarium (UTA Planetarium) that extends its mission to K-12 and public outreach. Since then, I have been running successful programs at UTA that resulted in attendance growth and strong engagement with the community.

Since 2008, I have been an active participant in planetarium conferences as well as local and regional planetarium organizations. I have served Southwestern Association of Planetariums (SWAP) as Vice President and President capacity (twice). I am currently the Past-President and IPS Representative of the same organization. I hosted very successful and well attended Western Alliance Conference (WAC 2014). I also bid to host IPS 2018 which Toulouse, France site was the winner. I attended IPS 2008 (Chicago), 2012 (Baton Rouge), 2016 (Warsaw), 2018 (Toulouse) conferences as well as several WAC, SEPA, GLPA, and LIPS meetings. I attended IPS Council Meetings in Montreal (2015) as the conference bid host, Toulouse (2018) and Reykjavik (2019) as the affiliate representa-

tive. I am an active member of IPS, SWAP, and GLPA.

I am currently serving at the IPS Vision 2020 committee for the goal #5. I am also a board member of Texas Space Grant Consortium (TSGC).

If I am elected as a new board member of the new IPS governance structure, my goals would be to help the organization to grow in membership, enrich its member benefits, and establish environments promoting diversity and inclusion within the organization. I would like to see the organization reaching 800+ members from all around the world standing as the umbrella organization to the entire planetarian community. I also would like to help the organization further the already initiated policies and procedures to eliminate discrimination and harassment within community and create safe, comfortable, and transparent platform for all. I fully support the zero tolerance policy in the aforementioned issues.

In conclusion, as a young member of the community I am very motivated to serve at the IPS board and engage in open, transparent communication with the IPS members.

Nominated by: Southwestern Association of Planetariums

### Benjamin Mendelsohn Region: North America

As a youth, I attended every new program produced at the A.F. Morrison Planetarium at the California Academy of Sciences in San Francisco. Little did I know...

Attending high school, I was introduced to Charles Hagar, who ran the planetarium training program at San Francisco State University. He let this high school student use the Spitz 512 and recommended me to Morrison Planetarium when they were looking for student hires. That was the start of a quarter-century relationship as I worked in the many part-time positions at the Morrison Planetarium: usher, cashier, floor manager, weekend technician, and lecturer.

Enrolled as an undergraduate student in electrical engineering, I also taught in the Holt Planetarium and physical science program at the Lawrence Hall of Science on the University of California campus.

After graduation, I worked as an engineer in industrial automation and as a systems analyst. After finishing graduate school in aerospace engineering, I worked as a NASA contractor on a space biology project.

While working in my various engineering positions, I also taught astronomy at San Francisco State University (Professor Hagar hired me once I had a college degree) and in the Minolta Planetarium at DeAnza College.

In 1998, I became the full-time astronomy faculty and planetarium director at West Valley College. We teach our classes, primarily to non-science majors, with a Spitz A4, though I'm now putting the finishing touches on a new 41-foot hybrid planetarium to be completed this year.

I served as president of the Pacific Planetarium Association (PPA) from 2006-2017. I attended my first IPS meeting in Chicago in 1980 and have served as IPS PPA affiliate representative since 2013. As a

The number of board members from each zone is determined by the number of current IPS members:

- one for zones with fewer than 50
- two for zones with between 50 and 499
- three for zones with 500 or more

For this election, that means:

Africa: 1  
Asia: 2  
Europe: 2  
Latin America: 1  
North America: 2  
Oceania: 1



Dayna Thompson



Michele Wistisen

All board members will be elected in 2019. Regions with two members will have a 3-year and a 2-year term (based on the number of votes). Regions with one member will be randomly assigned a 2 or 3 year term. This will ensure that future elections will be staggered so that not all board members end their terms at the same time.

member of the council, I have been participating in the Vision 2020 initiative to restructure and reinvigorate the IPS. I am honored to have been nominated as a perspective board member to represent North America.

As you may glean from my background, I bring a familiarity with small and large planetariums, the perspective of an educator from science museums and academia, industry experience, and expertise as an officer. While I embrace technology, I feel that IPS conferences should emphasize the mission of the planetarium as educational institutions. As a board member, I will continue to work for you on IPS reorganization in support of your educational mission, achieving balance between individual/institutional desires and vendor needs, attracting new membership to invigorate IPS with fresh ideas and energy—all in a spirit of diversity and inclusion.

Nominated by: Pacific Planetarium Association

### Dayna Thompson Region: North America

I am running for one of the IPS North America Board positions in order to help represent the current climate, concerns, and goals of our planetarium community. I understand the commitment involved, and I am prepared to provide my wholehearted dedication to serve the IPS. Additionally, Ball State University (where I am director of the Charles W. Brown Planetarium) and my Dean are in full support of my current and future efforts to represent, and travel for, the IPS.

My past roles in professional associations have prepared me for this position. For example, after hosting the 2014 Great Lakes Planetarium Association (GLPA) conference, I served on the GLPA Executive Committee as technology chair and webmaster for almost three years. I remain an active member of the GLPA Technology Committee today.

Furthermore, I am a member of the IPS Education Committee and I serve as a sub-committee member for the IPS Vision 2020 Goal #6, formed to encourage younger members to become involved in the future of the IPS. As a member of the IPS Education Committee, I played a major role in the creation of documents outlining the value of education in the planetarium. It is my goal to help create more member resources for our community as a part of my future IPS leadership.

I regularly contribute to articles to *Planetarian* and volunteer my time for various IPS causes and initiatives. I am active on planetarium professional development sites and list-servs, and I volunteer my time regularly to update the IPS on-line event calendar. I also volunteered to design the document that outlines the new IPS Society Governance Structure, complete with a detailed map of the zones.

I understand the importance of communicating IPS goals and missions in a clear, descriptive, and concise manner. Additionally, I understand the

importance of branding, marketing, and advertisement, and my design and communication skills will aid in my continued promotion of the IPS on various platforms.

Working with multiple professional organizations and contributing to scholarly publications has afforded me experience in: leadership and management, conference planning and event production, marketing and communications, recruitment and retention, and more. These experiences helped me play a key-role in strengthening equity, diversity, and inclusion within the IPS by having direct, formal conversations with IPS leadership earlier this year.

If elected, I pledge to maintain an open dialogue with the North American planetarium community in order to remain mindful of the voices of my peers when representing our views on IPS issues; and I will endeavor to cultivate and maintain a culture where all of our opinions are valued, respected, and considered.

Nominated by: Great Lakes Planetarium Association

### Michele Wistisen Region: North America

I have a bachelor's degree in elementary education and a master's degree in curriculum and instruction. Working at the Casper Planetarium since 1996 has given me a fundamental background in astronomy. With that knowledge I have helped design astronomy curriculum for our school district, written and produced planetarium programs, and given presentation at various educational conferences.

In 2010 was selected to be the American Planetarium in Italy. This opportunity led me to host David Gruber from Italy in 2017 and Guilherme Marranghello in 2019 for the "A Week in the United States" program. I believe that we have a lot to learn from each other and participating in a cultural exchange is the best way to model good teaching.

I was selected to be a National Space Foundation liaison in 2012 and a Solar System Ambassador in 2018 and I still represent these organization as an outreach presenter. These organizations require me to do outreach throughout my community. As such I have developed a wide spectrum of presentations that range from NASA missions to how we know what stars are made of.

I am currently the president of the Rocky Mountain Planetarium Association and a member of the International Planetarium Society Education Committee. As president I attempt to make contact with planetariums in my region and invite them to participate in the RMPA and IPS communities. I also contribute regularly to articles in the *Great Western Observer*. As a member of the IPS Education Committee, I accepted the responsibility of being the contact person for the committee when people are looking for the best ways to teach in the dome.

My vision as a board member from North America would be to represent the various affiliate groups



Martin George

#### Duties of Board Members

- Active involvement in IPS issues;
- Maintaining contact with other board members, the IPS officers, affiliates, and IPS members within their continental zones;
- Representing, at board level, IPS members and affiliates within their continental zones, by canvassing them to gather comments and suggestions about IPS issues;
- Promoting IPS within their continental zones; and
- Where reasonable, attending affiliate meetings within their continental zones either personally or electronically (i.e. via Skype).

from each region and to present their needs to IPS, and to see how IPS could help them. One issue that I see now is the National Science Standards, which many states have adopted, has virtually eliminated astronomy from the elementary curriculum. As a school district planetarium I have had to find ways to address the new science standards and keep school groups satisfied that a trip to the planetarium was worth their time. By collaborating with the American affiliates I believe we can address this issue and work with planetariums around the world to create new content/curriculum that would be valuable to any planetarium, no matter where they are in the world.

As an IPS board member I believe it is important that we send the message that all are welcome at the table where we can work together to inspire the next generation to appreciate our small blue dot and participate in our efforts to explore our universe.

Nominated by: Rocky Mountain Planetarium Association

### Martin George Region: Oceania

I am delighted to have been nominated to represent Oceania on the International Planetarium Society Board, which is the new form of governance for the Society.

I have been a planetarian since 1983, as manager of the Launceston Planetarium in Tasmania, Australia. Even before that time, I was passionate about the communication of astronomy. For decades, in pursuing that aim, I have written newspaper articles and appeared on radio and television in Australia—and, on occasion, in other countries.

Most importantly for my IPS Board member candidacy, I have been a member of IPS since 1990, and since then I have attended all IPS conferences except those in 1992 and 1994. I have been pleased to serve the society as president in 2005-06 and have attended many IPS Council meetings as representative of

the Australasian Planetarium Society. It was during my term as IPS president that IPS held its first southern hemisphere conference, in Melbourne in 2006.

I have been chair of the IPS International Relations Committee and the Elections Committee for many years.

My International Relations role in IPS has included “spreading the word” about IPS in many areas of the world that have low membership. Currently, this especially includes Thailand, where I have been working with Thai planetarians to encourage IPS involvement and the formation of a Thai Planetarium Society.

My Elections Committee role sees me overseeing the IPS election process together with other committee members. As of 2019, this role also involves overseeing the election of board members. I have been nominated as an IPS board member by the Australasian Planetarium Society even though I am also chair of the IPS Elections Committee. I shall therefore, of course, ensure that an independent scrutineer will verify all election results.

I have been of secretary of the Australasian Planetarium Society (APS) most years since its formation in 1998. Here in Australia and New Zealand, the planetarium community is a strong and friendly one. New planetariums are in planning, and the number of mobile planetariums is increasing.

The APS meets yearly at a planetarium venue in Australia or New Zealand, and attracts members from many different planetariums around the region. Our most recent conference took place in Adelaide in early 2019, and the next will be in Melbourne in early 2020.

As an IPS Board member, I shall increase my focus on IPS matters in the Australasian region and promote, through IPS, the planetarium industry in Oceania in general, as well as continuing to fulfil my other IPS obligations.

Nominated by: Australasian Planetarium Society ☆

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### President’s Message , continued from page 8)

of Iceland museum and planetarium. The founder of the museum, Gunnar Gunnarsson, gave us an excellent tour of the facilities and engaged the council members in discussion about their unique business model. The museum operates as a commercial enterprise.

**June 24-26 Dagstuhl Germany:** Right after the council meeting I headed to the Schloss Dagstuhl seminar on Astrographics. As described in this month’s Data to Dome column, one of the main things we worked on was the development of a white paper for the Astro2020 US Decadal Survey. This white paper makes the case that planetariums can be utilized as research grade visualization facilities, and argues that funding should be provided to make that happen.

**June 27 Heilbronn Germany:** From Dagstuhl I drove to Heilbronn, where Johan Gysenbergs gave me a tour of the incredible planetarium at the new

experimenta science center. The planetarium has the capability to rotate 180 degrees, transforming itself from an auditorium with a stage to a planetarium. During this visit the experimenta CEO Wolfgang Hansch formally indicated experimenta’s desire to bid for the IPS’s 2024 conference.

**June 28 Heidelberg Germany:** On my way to the airport I took a brief detour to visit the Haus der Astronomie, an education and outreach center with a large planetarium on the grounds of the Max Planck Institute for Astronomy. The building is shaped like the galaxy M51. During my brief visit I got to talk to Thomas Müller about various planetarium visualization initiatives.

So that wrapped up a whirlwind 1.5 months as IPS president. It isn’t always this crazy with travel, but we are always looking to promote and advance the planetarium. ☆

# Illuminating our Audiences: Exploring What Engages and Confuses Them



Creighton

Dr. Jean Creighton  
Planetarium Director

jcreight@uwm.edu



DeVasto

Dr. Danielle DeVasto, Visiting Assistant Professor  
Rhetoric and Professional Writing Program  
dmhartke@uwm.edu  
University of Wisconsin-Milwaukee

## Abstract

We present responses from a general planetarium audience to two open-ended questions: what they found interesting and what they found difficult in a program about aurora that included stargazing. We find that people are more likely to engage with what they find interesting than difficult, and that people value explanations of complex phenomena. We also find that open-ended questions can highlight some of the presenters' blind spots.

## Introduction

We have been deeply curious about what techniques work best in a planetarium setting to communicate ideas with the general public<sup>1</sup> and also which ideas one should attempt to share. It is tempting to answer these questions from hunches, but often our own assumptions make it hard to know what works and what does not. Our intuition can be misleading; it is therefore important for the future of our profession to establish ways of evaluating what and how we communicate as suggested also by Plummer, Schmoll, Yu, and Ghent (2015).

In response to their call to develop a research culture in the planetarium field and implement research-based programming, we report additional results from our research on strategies for improving science communication (Creighton, DeVasto, & Gallagher, 2017).

<sup>1</sup> We are isolating general audiences because they are far less uniform than, say, a single grade school group.

In that study we used questionnaires to establish what audiences learned about the formation of the aurora and whether an analogy would help them understand the electron transitions. Everybody learned about aurora, some at a more superficial level than others: 91% of the respondents answered correctly all true/false questions, and 45% understood the cause of the aurora well enough that they could also choose the correct schematic for the electron transition from multiple illustrations.

To our surprise, the analogy we used did not help audience members answer more questions correctly; if anything, it confused people. Audience members self-reported that the diagrams that showed the atomic structure and the permitted energy levels of electrons helped most. In our first paper we analyzed all the data that was easily quantifiable, such as the true/false and multiple choice questions.

After we had time to digest the data that was easily quantifiable, we tackled the responses from our two open-ended write-in prompts: what idea was most interesting and what idea was most difficult. We wanted to see beyond the true/false types of responses to isolate what people found engaging and what they found confusing. Would people find it worthwhile to try to grasp atomic structure to understand aurora? And if they did, should that encourage us to be more adventurous in what we present? We conclude that audiences are hungry to learn more about interesting

topics even if they can't be explained in 140 characters.

## Results

As discussed in our first paper, we received a total of 455 questionnaires for the entire run of *Northern Lights*, 297 of which were usable (67%). Our experience is that people are much more likely to check a box than to write in a response, so we were delighted to see that 231 people (78% of the usable questionnaires) wrote something that was interesting! Even if we include every adult, that is still 55%, which is amazing given that some people are simply not prepared to write anything on a questionnaire on a given night (for example, they don't have their glasses, or they feel too tired to engage with what looks a bit like a test).

We developed a provisional set of topics that emerged from a sample of responses to the open-ended questions. As a group, we then applied the provisional topics to one show's set of questionnaires, revising our scheme based on subsequent discussion. Over the course of several days, we independently coded all "interesting" and "difficult" responses. Periodic conferencing throughout the coding process allowed for refinement, clarification, and consistent use of the topics. For ease of analysis, we assigned each topic a code number (for example, a blank questionnaire was coded as 13).

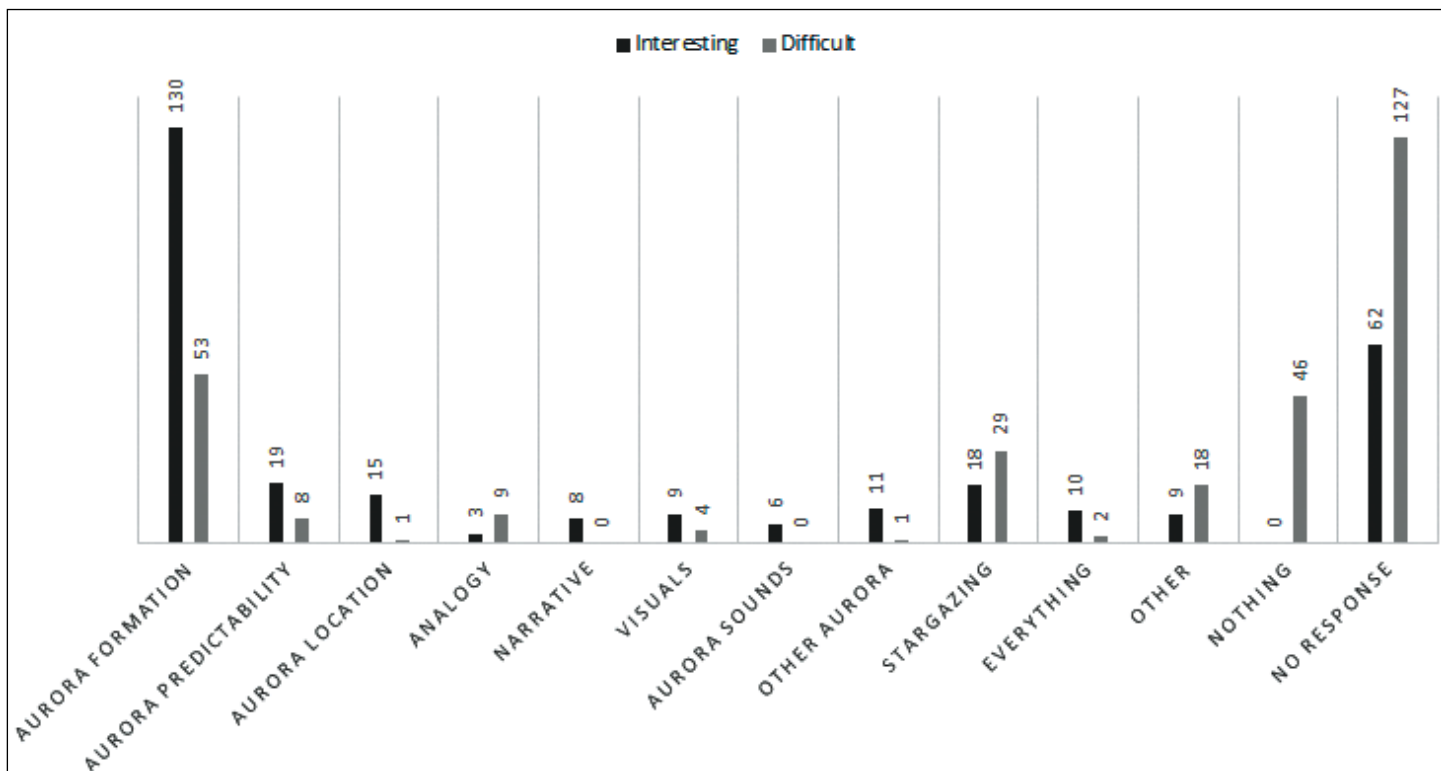
## What is Interesting?

There were 243 instances of something being marked as interesting. Perhaps it should be expected that the most popular topic (130 or 43%) had to do with the formation of aurora, either as an overall theme (30 instances) or as a specific aspect of the formation such as solar flares and magnetic fields (48), colors associated with aurora (23), the electron transitions that cause them (23), their location in the atmosphere (4), and atomic structure (2).

The second most popular topic had to do with how one can predict when aurora might occur based on the value of the K-planetary index (19, 6%).

The third largest category of interesting topics was stargazing, with 18 responses (7%).

By the time we include the top three categories, we have accounted for 69% of all interesting topics (see Figure 1 for total distribution



**Figure 1: Distribution of topics found most interesting and difficult across all Northern Lights shows**

of interesting topics). There were 9 responses that were hard to characterize (such as “various make up of spheres,” “what does this mean,” and “Hillary Clinton.”). There were 62 questionnaires of the 297 usable ones that left the “interesting” question blank (21%).

### What is Difficult?

When we looked at the concepts that audience members found difficult in Figure 1, we see some noticeable differences from what they found interesting. Out of the 297 questionnaires, only 170 (57%) of the respondents put any ink in the difficult fill-in question as opposed to 235 (79%) who filled in the interesting concept question. When audience members actually wrote something in the difficult question, aurora formation was reported the most difficult 53 times (31% of inked responses and 18% of all of them). There were 28 instances in which people found aurora formation both the most interesting and most difficult topic. The second most common response was that “nothing” was difficult with 46 instances (which is 27% of all inked responses and 15% of all). This deserves repeating. Almost a third of people who went to the trouble to write something said specifically that nothing was difficult, whereas in the interesting responses, people never said “nothing” was interesting. Perhaps this was a way of signaling to the presenter that the material was discussed in an accessible way.

Perhaps the audience didn’t want to say anything negative, which is consistent with our finding that audiences did not say even once that “nothing” was interesting.

Another surprise is that 29 people (10%) thought that stargazing was the most difficult concept. This requires some explanation because it is not an isolated response—we have seen it before (Creighton & Toro Martel, 2010). How could arbitrary patterns in the sky be considered a difficult concept? We have a few ideas. First of all, stargazing is the part of the presentation the audience most recently saw and for which they get immediate feedback. The audience is asked to point to a particular pattern they just learned, and they find out right away, with the help of a laser pointer, whether they identified the constellation correctly. The participants know immediately how successful they are at finding the constellations whereas they don’t get feedback about the aurora related questions. Secondly, audience members might be more invested in learning constellations because it is more applied to daily life: people are significantly more likely to identify Orion in the night sky than to describe the de-excitation of electrons. Furthermore, the skill of knowing constellations is something they can share with other people, even show off. Finally, many people think that constellations have more significance than they really do—people think they are missing something if they can’t

see the square of Pegasus or the trapezium of Virgo. These three responses for difficult (aurora formation, “nothing,” and stargazing) account for 75% of the written responses.

### Does understanding change what is interesting and difficult?

We were also interested in knowing the impact comprehension had on what people found interesting and difficult. We measured understanding by a set of four questions. Three of the four questions were true/false statements about the location, color, and cause of aurora. The fourth question required audience members to select the diagram that best described how aurora form. If all four content questions had been answered successfully, the questionnaire was considered “correct.” (See Creighton, DeVasto, & Gallagher, 2017 for more discussion of this data.)

In Figures 2 and 3, we see that regardless of understanding, the general rank of what people found most interesting or difficult remained roughly the same. When we consider people’s understanding (as demonstrated by the questionnaires), people with correct responses had more evenly distributed responses for difficult concepts. Additionally, the range of topics that were reported to be difficult by people who understood was more focused (7 topics vs 11 difficult topics on incorrect questionnaires and 13 interesting topics

*(Continues on next page)*

for both correct and incorrect questionnaires). In other words, people provided specific, more nuanced responses for interesting rather than difficult concepts.

Another noteworthy observation from Figure 3 is that people who understand the material are more likely to engage with what is difficult compared to people who didn't understand. Twice as many people who correctly answered the questions found "nothing" difficult compared to people who did not. This difference suggests a level of self-awareness among our respondents: people who were confused were less likely to say that nothing was hard for them.

## Conclusions

From our discussion, here are some suggestions to use to engage audiences.

### Break the ice/start the conversation with what's interesting.

Planetariums are key sites where the public chooses to engage with science. One way to take advantage of this fact and continue to build important relationships and foster public-science interaction is to start conversations with what's interesting. As our results show, a lot more ink was used to describe the interesting than the difficult. This difference suggests that, all things being equal, people are more willing to engage with what they find interesting than what they find difficult. Furthermore, even though most respondents did not "get" all of the material presented (55%), most people *wanted* to engage with the material they thought was interesting regardless of if it was difficult. We were intrigued by the fact that between 11%-22% of respondents explicitly wrote that "nothing" was difficult, whereas no one said that "nothing" was interesting. They either found something interesting or left the item blank. Only 17% had no response at all, suggesting low engagement with the material and with us.

### Asking open-ended questions helps to illuminate our blind spots.

As part of the important work of understanding our public audiences, this study shows the value of asking open-ended questions. There are advantages, of course, to using close-ended questions like true/false statements. People are more likely to check a box, so we secured answers from a larger portion of the audience than if we had simply asked them to write things in. But responses to close-ended questions give only part of the picture. Also, close-ended questions can be influenced by what hypotheses we bring to the table. For example, we expected that aurora formation would be the hardest concept, but the open-ended questions of what is interesting

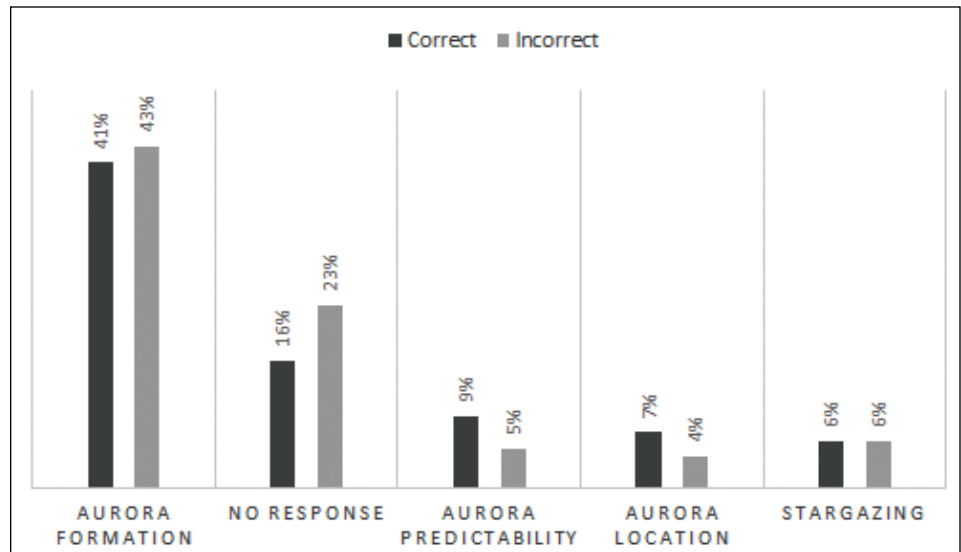


Figure 2: Topics found most interesting by questionnaire correctness

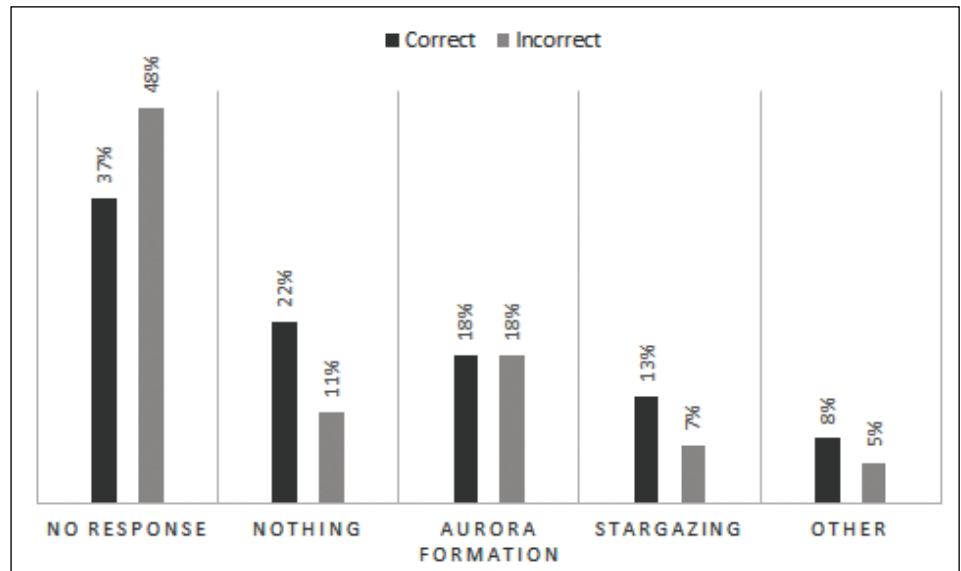


Figure 3: Topics found most difficult by questionnaire correctness

and what is difficult gave us insight into our blind spots. Aurora formation was the top choice for the most difficult concept (after no response at all and "nothing"), but it was only 5% higher than stargazing in difficulty among people who answered the questionnaires correctly (see Fig. 3). That brought to our attention that people need more preparation, more discussion to feel comfortable with the constellations, which was contrary to our expectations. Open-ended questions allow our audiences to be heard, to have a voice, which makes these spaces more welcoming for engagement with scientific topics as discussed in DeVasto & Creighton (2018).

### Open-ended questions are not without their challenges.

Planetariums need to use open-ended questions carefully if they want to solicit feedback, particularly about what audiences find diffi-

cult to understand. As we previously noted, the most common outcome when asked what idea was most difficult was no response at all. One challenge of open-ended questions is that people might not be able to isolate a particular idea or explain what they did not understand and, therefore, give fewer answers than if we had offered multiple choices. People who did not understand the material were more likely not to write anything in as opposed to those who did. In other words, people who have an uneasy feeling about the material are less likely to discuss its difficulty. Audiences might also avoid pointing out what was difficult because they don't want to "make anybody feel bad." To help counter this, we can provide disclaimers that explain why we are soliciting their feedback. We can also explain that we are evaluating our communi-

(Continues on page 36)

# BIRTH OF PLANET EARTH

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# Fulldome cinema adds new perspectives on Nordic Film Days Lübeck in Germany



Since 2016, a mobile dome has added an exceptional event towards promoting and innovating immersive media and planetariums outside the planetarium community. With a fulldome 360° cinema, it is a stage for presenting innovative immersive and interactive media as a vivid new venue amidst a traditional film festival in Northern Germany.

The mobile fulldome cinema during the film festival has become an exciting place for using immersive media such as fulldome video and converted spherical 360° movies as well as adapted interactive VR experiences to promote the planetarium as a stage for collective immersion.

It was initiated by Ralph Heinsohn, producer and curator of immersive media as well as creative director at the new Science Dome at Experimenta Heilbronn, a new 21.5-meter dome in the southern city of Heilbronn, Germany.

This article describes the overall project, how it reaches out towards the Nordic Planetarium Community, and the innovative program of the fulldome cinema at the festival.

Ralph Heinsohn  
Science Dome at Experimenta  
Heilbronn, Germany  
Aase Roland Jacobsen  
President, Nordic Planetarium Association  
University of Aarhus, Aarhus, Denmark  
Carsten Skovgaard Andersen  
Stjernekammeret Planetarium  
Bellahøj Skole, Copenhagen, Denmark

## The history of the festival

The city of Lübeck is located on the German Baltic Sea coastline. The Nordic Film Days Lübeck, first presented by the Lübeck Film Club in 1956 and taken over by the Hanseatic City of Lübeck in 1971, has one of the longest traditions of any film festival worldwide. It is the only festival in Germany, and the only one in Europe, which is entirely devoted to the presentation of films from the North and Northeast of Europe.

The connection between Northern Germany and the Nordic countries has a historic dimension: The countries covered by the festival match the historic Hanseatic League, an economic trade group from the 14th to 17th centuries, in which the city of Lübeck was the economic center and cultural melting pot in the Baltic Sea region. Because of its extensive brick gothic architecture, the city is listed as an UNESCO World Heritage site. Nowadays it has a population of about 220,000 people.

Feature films, documentaries, and short films from Denmark,

Facing page: In the background, the historic city of Lübeck as seen from the river. Photo by Axel Straschnoy. Inset, from left: Second downtown location of the fulldome cinema in 2017. Photo © Ralph Heinsohn. Lucid Trips (by VR Nerds Hamburg) as the Interactive Dome VR premiere, and inside the fulldome cinema. Both © Nordische Filmtage Lübeck. All images used with permission.

Estonia, Finland, Greenland, Iceland, Latvia, Lithuania, Norway, and Sweden are presented at this five-day event each year during the first weekend of November.

In addition, there is an extensive children's and youth film program and a retrospective devoted to important eras, specific genres, or famous persons of film history. The so-called "Filmforum" section presents films from North Germany. The film program is accompanied by seminars, roundtable talks, concerts, and readings.

Nordic Film Days Lübeck is both an audience festival and an important meeting place for the film industry. Many directors whose debut works were presented in Lübeck have gone on to earn fame around the world, people such as Bille August, Lasse Hallström, Aki Kaurismäki, and Fridrik Thór Fridriksson.

The festival is an important cultural event in the city, and it is very successful. In 2018 there was a new record of attendance with more than 36,000 people visiting the festival during its 6 days.

All festival venues are within walking distance in the historic city center. The festival takes place in two main cinemas of the six that Lübeck hosts, with more than 12 movie screens in use. The official gala and award ceremony takes place in the city's main theatre—a beautiful art nouveau building from 1908 that seats 1220 persons that is ideal for awards presentations—and now also in a mobile dome in the city center. Altogether, eight prizes are awarded every year for various categories of the traditional film sections.

Visitors, easily identified by their festival badges, share their festival experiences in the cafés and coffee bars of the cozy historic town. Producers, actors, and other members of the production teams are invited and present on the festival to get into dialogues with the audiences. The lovely atmosphere characterized by intense talks and exchange of inspiring ideas is what makes up the spirit of the festival.

### Fulldome cinema as a new venue

In 2016, Ralph initiated a mobile dome as an experimental new venue of the film festival, inventing the section of immersive media for the classic film festival of his hometown. He has been a fan of the festival all of his life and has attended since he was 14 years old.

With a professional background in the full-dome community, his idea was to create new synergies for Fulldome experiences outside the planetarium community—and to experiment with new forms of interactive live entertainment amongst an audience being unfamiliar with planetariums. Also, it was the idea to support fulldome productions not related to the traditional astronomy and science topics that would hardly been shown in planetariums.

The city of Lübeck does not have a planetarium or digital dome theatre, with the nearest fulldome installation at the Hamburg Planetarium.

Visitors have been overwhelmingly eager to visit a mobile fulldome cinema since its first appearance at the Nordic Film Days 2016. It has become a huge success, running shows every full hour during days and evenings. It has an average number of 93% fully booked shows. It started out with a small mobile dome of 40 seats and now takes place in a 15-m portable climatized outdoor dome with maximum capacity of 150 seats.

And it is the same criteria that apply to the selected films as with the general film selection of the festival: The immersive fulldome shows are created or shot on location in the Nordic and Baltic countries or from Northern Germany, or being created with topic about or by producers from or with affiliation to these countries and regions.

As finding content suitable for the festival criteria is a challenge, it was soon clear that the fulldome cinema would be constituted by a curated selection, rather than a submission-driven contest.

### The NPA co-hosts

Immediately after initiating the dome, Ralph reached out to the Nordic Planetarium Association (NPA). The countries that are presenting their films at the festival are exactly the same Nordic and Baltic countries that are part of the Nordic Planetarium Association (NPA) community. NPA, established in 1990, has been actively sharing planetarium dome experiences and meets every 2 years, so it was only natural to reach out to NPA and find contact with the president. By coincidence, it showed up that President Aase Roland Jacobsen was a long-time planetarium friend of Ralph!

The collaboration between NPA and the dome setup was done right away because Aase could see a great opportunity for Nordic and Baltic fulldome productions to get a broader audience. Aase joined as co-host in the dome to share the vision of the festival as a festival partner and representative for the Nordic Planetarium Association.

The 10 counties that are in the Nordic and Baltic countries all speak different languages, so when a planetarium makes a production it can only be shown in the country where it is produced. Otherwise, it has to be translated. And there might only be a handful of planetariums or less in a certain country that has the equipment to show fulldome films.

Therefore, Aase saw this great opportunity for fulldome productions to reach a new audience when shown in Lübeck in their native languages. Lübeck opens a window to the Nordic Planetarium community.

It created an interest for planetariums in NPA to collaborate with the film festival and Ralph is now a member of NPA and a valued speaker and meeting attendee.

Aase has enjoyed being the co-host at the dome sessions, especially enjoying how interested the audiences are in asking questions of the producers of the films. Every introduction and questions afterwards are done switching between German, English, Swedish, Danish, Norwegian, Lithuanian, Latvian, and Estonian, depending on the native language of the film.

A perfect illustration for opportunities for Nordic fulldome shows is the Swedish production *Under Ytan (Below The Surface)*, an underwater expedition that reveals the secrets in the Baltic Sea.

The show was produced by Visualization Center C together with Sjöfartsverket. Based on measurements and studies that Sjöfartsverket has done, it reveals how the bottom of the Baltic Sea looks and shows wrecks, mines, and environmental degradation, and illustrates how the current methods of measurement are used to map the bottom of the sea. The film was originally not intended to be internationally distributed or shown outside the Norrköping Visualization Center in Sweden. Through the international premiere in Lübeck, the people of all neighboring Baltic countries were able to get an insight into the Swedish perspective on the Baltic Sea.

The multi-award-winning Finnish fulldome production *The Secret World of Moths* by Hannes Vartiainen and Pekka Veikkolainen was also among of the films that initiated the fulldome dome cinema back in 2016. The amazing show is a magical journey to the world of moths. Using 3D X-ray tomography, it sheds light to their hidden macrocosm and explore their way of life in an unprecedented way. This show is nowadays being distributed around the globe, translated into many different languages.

(Continues on next page)



From top: The Infinity Dome at the festival (Ralph Heinsohn); official Finnish embassy reception in the dome, an event for anniversary of Finnish independence in 2017; VR in the dome; the “Code of Freedom” experience. (Nordische Filmtage Lübeck)

In 2017, the fulldome production *Experience the Aurora* by Norwegian full-dome film maker and Aurora hunter Ole Salomonsen celebrated his international premiere, the first time it had been screened outside Tromsø in Norway.

As Ole comments:

*For me this was the first film festival I attended with my film. And although not a fulldome only festival, it was really exciting for me. I was super excited to be invited.*

*I have been recording the auroras for many years in both stills and regular 16:9 video. Five-6 years ago I also started capturing footage for my film *Extreme Auroras*. In the beginning I brought a single extra camera using a fisheye all-sky lens, shooting time lapse. As years went by and technology developed I wanted to make the shots in even better resolution and motion. So I started to use multiple cameras (dual) and even filming in real-time video in 4K. It is challenging recording the auroras because winter is harsh and temperatures can be low. There is a lot of waiting involved, many times you sit out in the dark for hours, with nothing happening in the sky. Producing high quality shots of footage made in the dark is challenging in many ways. Both cameras, batteries and lenses need to be protected from the cold. And putting the footage together in high res 4K is also very time consuming and challenging.*

*The first time my film was shown to an audience was in the local planetarium in my hometown Tromsø. This was very nice and the feedback was very good. But in Tromsø many people know me, and know my aurora productions. So I was even more excited to present this to an audience outside of Norway. The beautiful city of Lübeck and Nordic Film days was the perfect opportunity for me to show my film outside of Norway.*

*Attending a film festival gives you so much more than just premiering in a planetarium since you get inspirations from the whole festival. You're inspired by watching other films, and also the audience attending a film festival are genuinely interested in film in general, not just full dome film, and that makes the feedback you get genuine and real.*

And last, but not least, in 2018 the dome hosted official receptions with Nordic and Baltic embassies due to the 100th anniversary of the declaration of independence of the state of Iceland, as well as the three Baltic states Lithuania, Latvia, and Estonia. In accordance to this event, Ralph converted 360° video material for the dome provided by the official national tourist boards of the countries.

## Innovation and STEAM

As several studies from members of the IPS and the global planetarium community show, the major share of fulldome show content is about astronomy, followed by other sciences.

So, when it comes to a pool of non-astronomy or even non-science-documentary shows—in other words, fictional narration or even artistic content—we are talking about a niche market.

Because our venue is a film festival, you need to use the dome first of all for non-astronomical projections—and that gives several new opportunities for dome projections. Now, figure in starting to curate a fulldome program out of the small fragment of non-astronomy, non-science documentaries—with the additional limitation of having to be produced in or with affiliation to Nordic or Baltic countries and the northern German region, and now you have a true challenge!

But, as time has shown, narrow frameworks tend to spark creativity, and it has not been a problem finding interesting shows in the Nordic and Baltic countries, especially now due to the networking that has been done reaching out to the NPA planetarium community.

Several converted spherical 360° movies created for VR headsets premiered at the festival, such as “The Arctic Mission” by SKY VR (UK) directed by William Samaha and produced for head-mounted-display based VR.

And in 2017, Ralph and his technical partner Bastian Barton created their “Interactive Dome VR” plugin for VR experiences that had originally been created for such room-scale tracked VR experiences such as “Lucid Trips” (by VR Nerds /Nico Uthe from Hamburg, Germany) and “Nothing Happens” by Michelle and Uri Kranot from Denmark.

In these VR experiences, one artist at a time performs the VR experience live on stage inside the dome, and his digital immersive spherical environment is

broadcasted simultaneously live on the dome, as a kind of 360° second screen. The result was a true social VR experience from the individual adventures.

In the future, fulldome productions in the field of VR has this great opportunity to do VR as a social event, and productions in the whole area of STEAM are represented in the dome: Artwork, VR interaction, music, and sonar visuals combined.

This became specifically evident in 2018 in a Lithuanian VR production by Gluk Media from Vilnius as an international premiere event created for the Nordic Film Days in Lübeck. The VR experience recreates the historic event and atmosphere of the Lithuanian declaration of independence in 1991 and the implied aggression of Soviet tanks at the TV tower of Lithuanian TV in Vilnius.

As the technical director Bartosh Polonski mentions:

*The painful issue in VR community is isolation. While you are having fun watching VR, others just see a flat impression of what you actually experience. In Lübeck VR curator Ralph changed that. He created a VR dome system, which "allows a collective experience of VR content without putting HMD devices on." Festival attendees experienced ours, not limiting themselves with any cables and hardware.*

And, as director Andrius Lekavicius states:

*When I became actively interested in virtual reality, the tragic January 13<sup>th</sup> events was the first idea that came to my mind. The first Lithuanian interactive VR doc experience must be based on the experience of this day, because the country that we have now, started in those very moments.*

*What happened that night is almost impossible to describe in words. Images also don't fully illustrate the atmosphere of the night. Most witnesses who were there that night are saying: "You had to be there." With VR you can make it happen. Be at the TV tower on the night of January 13. Not only be the viewer but participate in the story. It's getting harder to show this recent history in archive photographs, to speak about it in annual TV programs, and each year to show the same archival videos. You need experience. But you need to be truthful to history and maintain authenticity. It's a blend between empathy and a journalistic story and raises very interesting behavioral questions: How would you react in situations of danger?*

*I've taken real events and, by adding gamification elements, created a story for interactive VR experience. "Code of Freedom 1991" is a scripted 10-minute VR story, in which a user enters the bloodshed at Vilnius TV tower on January 13<sup>th</sup>, 1991 as a journalist with a camera and has to make the toughest decision of conflict journalism—to film and make evidence of Soviet army aggression or to help wounded peaceful protestors.*

Long discussions with the audience after the presentation showed that there is true value in making the individual VR experience a group event—people were thrilled to witness the historic events in a simulation.

In other words, the fulldome cinema immediately became a lab, a kind of experimental workshop and stage for technical innovation as well as researching audience feedback on these new forms of presenting immersive entertainment.

And it was even possible to go beyond digital experimentation, in terms of live video output to the dome: In 2018 we featured the project "Kymat" by Hamburg-based DJ and sound artist Sven Meyer.

In an experimental setup, Sven creates music and ambient soundscapes with low bass sonic frequencies. A small cylinder containing water is exposed to the speaker of the sound setup. The bass frequencies "draw" graphic patterns into the surface of the water in the cylindrical container, and a 4K camera films these patterns and structures top-down. The video signal is then being streamed live via video capture card onto the dome surface. And there you are with analogue live dome visuals!

## The technology and dome setup

The mobile dome itself is a rental by the company TAT Team/Air structures. de, located not far from Lübeck. The dome is a (heated) inflatable dome for outdoor use at cold temperatures and windy weathers.

It is installed in the historic center of town with many sightseeing attractions  
(Continues on next page)



From top: inside the portable dome; the Kymat water event by Sven Meyer; more audience reaction inside the dome. By Nordische Filmtage Lübeck. Bottom: Carsten Skovgaard Andersen with the historic star projector during the festival.

1 For more, see [en.wikipedia.org/wiki/January\\_Events\\_\(Lithuania\)](https://en.wikipedia.org/wiki/January_Events_(Lithuania)) and [www.dw.com/en/the-january-bloodbath-in-lithuania-25-years-on/a-18976152](https://www.dw.com/en/the-january-bloodbath-in-lithuania-25-years-on/a-18976152)



The Stjerneammeret at Bellahøj Skole in Copenhagen with Carsten Skovgaard Andersen (left) and Ralph Heinsohn Photo: © Aase Roland Jacobsen

## A series of fortunate events leads to historic projector discovery

The discovery of a sensational, yet nearly unknown, analog star projector was an unexpected result of the Nordic Film Days Lübeck.

- Because Ralph Heinsohn had the inspiration to add a fulldome component to the film days, he cooperated with the Nordic Planetarium Association.
- Because he attended an NPA meeting in 2017, he met Carsten Skovgaard Andersen, director of the Stjerneammeret planetarium at the Bellahøj Skole in Copenhagen, Denmark.
- Because the two met, Heinsohn learned that Anderson's analog star projector in Copenhagen was built in 1937 in Lübeck.
- Because he learned of a projector built in his home town, Heinsohn began a quest to find out more.

Here is the story.

### An analogue star projector in the Fulldome Cinema

In September 2017, Carsten Skovgaard Andersen, director of the Stjerneammeret planetarium at the Bellahøj Skole in Copenhagen, Denmark, attended the Nordic Planetarium Association Conference in Lund, Sweden.

That is where he met Ralph Heinsohn and viewed his presentation on the Nordic Film Days. After learning that he was born in Lübeck, Carsten made him aware of his analogue star projector and the fact that it was made in that city in 1937.

This was a huge surprise to Ralph, because he had not known of it; to his knowledge there was only one known manufacturer of star projectors at that time in Germany, the company Zeiss in Jena.

Nevertheless, a mark of the manufacturer on the projector made Ralph study history and sparked deep (and as yet unfinished) research.

In 1931 the local electro technical engineering company E. Nachtigall and Co. produced a planetarium projector for a newly-built school in Lübeck. The star projector and its "star chamber" were part of a greater plan for a new school concept. The school, built in the spirit of the Bauhaus and with a concept that met the new political situation after the First World War that introduced reformist pedagogic concepts, attracted visitors from all over the globe.

Members of a school committee from Copenhagen were among those visiting the

(Continues on page 30)

and hotels in within visible distance, as well as near the city's biggest cinema, the main festival location. There are plenty of restaurants, bars, and cafes around.

An inflatable system was chosen because of its many advantages. Being located right in the "hot spot" of town, where infrastructure and traffic situations do not allow long installation times, the dome has to be installed fast. That is what inflatables are extremely good at.

Another advantage was the system provided offers the complete range of required services, which includes not only the mobile dome, but also the video projection system with extremely good projection quality and very fine negative pressure screen (optimized for the video projection system), and a flexible media server that was able to play back full-dome shows as well as create experimental setups such as live video capturing to display interactive VR projects. From 2019 on, the mobile dome will be a 15-meter inflatable with 150 seats and spatial sound system.

As the festival management keeps pointing out, the fulldome cinema is not only a new festival section. It creates links to new technologies and media forms. And beyond that, the mobile dome is a perfect marketing tool, creating awareness for the entire festival.

For the 60th anniversary of the festival in 2018, the astronomy special *Lights over Lübeck* with the Lübeck Star Projector (see accompanying story) was the center of attraction. With the help of this historical invention, we encountered new partners: The team of Lübeck's astronomical observatory installed a mobile station with telescopes outside the dome and offered information about the true night skies observation.

### The future of the fulldome cinema

The managing team of the festival has come to a clear result: The fulldome cinema was not just a temporary gimmick—it has come to stay.

There was a very positive atmosphere in the inflatable fulldome 360° cinema. In 2018, a selection of 15 films in seven different programs with a total of 54 public screenings and four press screenings gave the audience, both film professionals as well as film enthusiasts, the opportunity to encounter new ways of storytelling in an immersive environment.

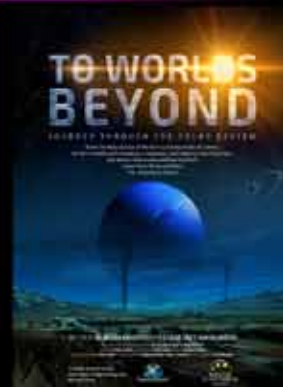
The directors were overwhelmed by the reactions of the audience, because usually their films are shown in planetariums without their presence. This way, the festival provides access to new technology and gets in touch with immersive media representatives and startups. And certainly, it attracts the attention of financial partners and is a beloved feature for city marketing and the board of tourism.

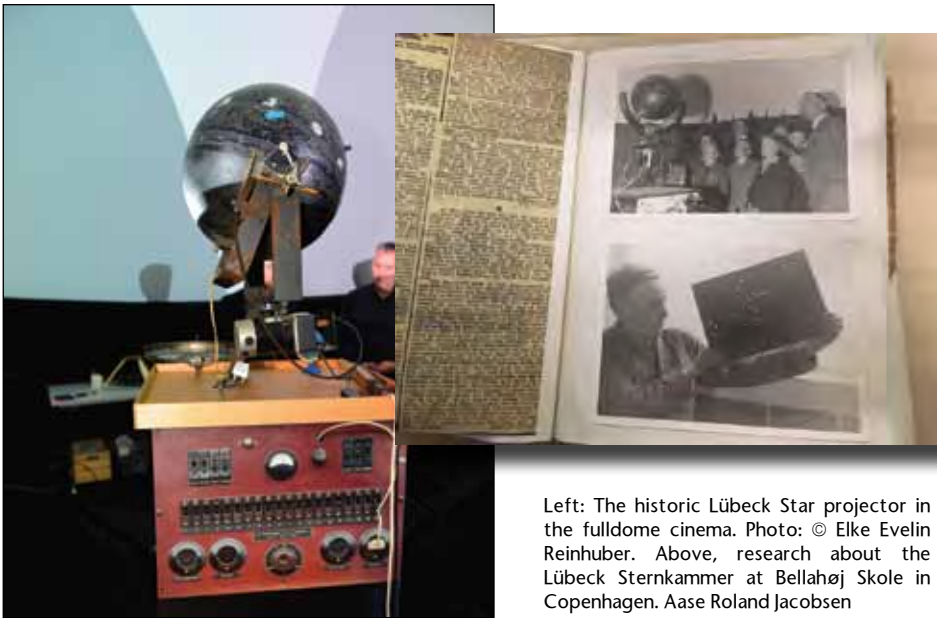
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# AVI PRESENTS LASERS LIVE!



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Left: The historic Lübeck Star projector in the fulldome cinema. Photo: © Elke Evelin Reinhuber. Above, research about the Lübeck Sternkammer at Bellahøj Skole in Copenhagen. Aase Roland Jacobsen

school. The teacher of the Bellahøj Skole at that time, Ingolf Andersen, was very eager to get a planetarium, and the Danish delegation was very impressed by the quality of the star chamber. Being much cheaper than a Zeiss projector, they bought a model developed for the Copenhagen school with a fixed dome of 6 meters in diameter.

Since 1937 this Lübeck star projector has been used to give planetarium shows in the Stjerneekammeret (a literal translation of the German term called "Sternenkammer") at Bellahøj Skole in Copenhagen. Looking back from now, this projector has given good experiences to students in Copenhagen for more than 80 years.

Some 5000 pupils visit Stjerneekammeret every year. Carsten has used the star projection in every one of the 19 years of running the "star chamber" in his school. Nowadays there is also a digital projector system, but still Carsten is convinced to use the analogue projector with its specific qualities, especially for live astronomy presentations.

Ralph was amazed by this story and decided to research further. He found out that there were more installations with this old star projector, but unfortunately only two models

survived WWII: the one in Copenhagen, and the original model in Lübeck. The original drawings of the dome were done between 1928 and 1930, so they date by only a very few years after the first public presentation of the Zeiss Planetarium.

### The factory didn't survive the war

Unfortunately, Nachtigall's factory was hit by a bomb during the Second World War. Just the outer buildings' walls were left, the workshop and factory being totally destroyed. After the war, the rest of the buildings were torn down.

Later Ralph found out that the factory was located just 100 meters away from the public square where the mobile dome is now being set up every year for the Film Festival. Today a hotel is located at the site of the former workshop of E. Nachtigall.

Before Ralph started his research and discovered that the projector has a working twin, a "model 1" in Lübeck, Carsten, Aase and Ralph had assumed that Carsten's projector was the only one left after the war. Ralph invited Carsten to come to Lübeck, bringing back the projector to its birthplace, and make live presentations in the mobile fulldome

cinema. This turned the dome, which was originally intended to be a non-astronomy-related venue, back into a star theatre.

Before organizing the trip with the historic projector from Copenhagen to Lübeck, Ralph produced fulldome time lapse shots, both from the rooftop of the Bellahøj Skole and from the Lübeck public square, to create a sunset and dawn video for black level adaptation within the analogue astronomy shows, combining the star projector and the modern fulldome projection technology as a unique hybrid system.

Finally, during the festival in November, school classes from Lübeck visited the fulldome cinema. Carsten made a live astronomy presentation with the old Lübeck Star Projector from 1937.

The historic star ball has a point light source inside of a 40 cm iron sphere. It creates light spots on the dome projected through drilled holes. The projector has a well elaborated rotation joint so that audiences could experience the Earth's rotation around the pole star.

### The students inspired parents

In the evenings, Ralph and Carsten made shows for grown-ups, not only about astronomy but also about the history of the projector. In the following days, many parents whose children visited the shows in the mornings showed up. The parents wished to see why their children talked about stars at the evening table and again at the morning table.

Within the festival Carsten, Ralph, and Aase visited the historic sites and also got in touch with the local school, which was home to the "model 1" of the projector. A partnership between the schools in Lübeck and Copenhagen is being considered.

Excitingly, what started out as a coincidental encounter turned out to be a major project for Ralph, who is exploring the invention's history to preserve the facts and documents and to even carry the idea into the future. He has fallen in love with the story and feels a responsibility to take care that this story does not get lost.

He even discovered two great grandsons of the developers of the star projector, who were amazed to be contacted and now support his researches with plans for upcoming Nordic Film Days and also the 100 anniversary of the planetarium in 2023-2025.

Questions and answers yet to be discovered: What was the specific motivation to create a new projector? How far did it spread internationally? Why is there so little information about the projector?

Ralph and Carsten will continue their professional research about the historic star projector and are preparing detailed papers and information for the official events of the planetarium centennial celebration. ☆

### Nordic Film Days Lübeck, continued from page 28)

For NPA, the dome setup is a change connecting to new audiences, and for the film festival, the collaboration with NPA will inspire people to show their fulldome production abroad. Ralph and Aase see great perspectives in future collaborations for NPA and Lübeck Film Festival and looking forward to more projects developing.

In addition, the audience that is attending the festival get a new experience while seeing fulldome movies and potentially may begin

attending planetariums at other places.

And the journey continues. For 2019 there will be further innovations in how to explore interactive dome art and audience engagement with interesting shows to come. So, if you are interested, please save the date and come to Lübeck in Germany October 29-November 3, 2019.

If you wish to know more, please get in touch with Ralph Heinsohn at [ralph.heinsohn@nordische-filmtage.de](mailto:ralph.heinsohn@nordische-filmtage.de). ☆

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*Huntsville embraces RGB laser*

## Rocket City takes off with world-class planetarium



By Judith Rubin

"Huntsville deserves a world-class planetarium," said U.S. Space & Rocket Center (USSRC) CEO and Executive Director Deborah Barnhart at the ribbon cutting for the new, 248-seat INTUITIVE® Planetarium on Feb 28, 2019. And now they've got one.

Named for its investor—local aerospace engineering and analysis firm Intuitive Research and Technology Corporation—the new planetarium takes USSRC from analog to cutting-edge digital, and from film dome to full-dome. By virtue of the custom technology package supplied by Evans & Sutherland (E&S), notably featuring five brand-new Christie D4K40-RGB laser projectors, this venue is a pioneering example of RGB laser projection in planetariums, a new standard-setter in many ways and for multiple markets.

"We hope everybody will go and see this installation to witness the astonishing capability of these projectors and this system," said Doug Boyer, senior account manager at Chris-

tie, who specializes in custom solution development for immersive visualization systems including giant screen, dome theaters, and 3D visualization centers.

Since its rollout, the Christie D4K40-RGB projector has been singled out for high marks and multiple awards in the AV community with respect to color, brightness, versatility and form factor. RGB laser projection technology, also called true or pure laser, uses individual red, green, and blue lasers to generate ideal light. This is unlike the more commonly known laser phosphor projectors and key to the ability of RGB laser projection to deliver the expanded color gamut known as Rec. 2020 (explained in more detail below).

"At the INTUITIVE planetarium, they're learning to take full advantage of all these colors—making it possible for audiences to see deeper into the cosmos, to see things that were not visible before," said Boyer.

"The images on the screen are sharper than

a knife—the black sky of the Milky Way providing a brilliant backdrop to the colorful Earth," wrote Paul Gattis, who attended and reported on the opening for AL.com.

E&S quickly snapped up 10 of the new projectors: five to install at its corporate headquarters in Salt Lake City for planetarium and dome cinema demonstrations, and five for the USSRC installation, an E&S ESX 8K system that integrates the Christie projectors with



The Christie D4K40-RGB projector



Facing page: The U.S. Space & Rocket Center from the air, showing off the scale of the Saturn series rocket; exterior of the new INTUITIVE Planetarium. This page: inside the dome during the VIP evening. All photos courtesy USSRC unless otherwise noted.

Digistar 6 and a Spitz Nanoseam™ screen to fill the entirety of the planetarium's 67-foot diameter, 30-degree tilt dome. "Together with our world-class alignment and blending system, the image looks stunning. We are excited to be the first to offer this powerful new Christie RGB laser technology to the market," President and Chief Operator Officer Kirk Johnson, Evans & Sutherland.

According to Johnson, the relationship between E&S and the USSRC developed through participation at various conferences for the planetarium and giant screen sectors organized by IPS, IMERSA, GSCA, and others. E&S and Christie often collaborate to provide the industry with opportunities to see their products and systems in action, and in the past five years this has included demonstrations and comparison shootouts at the Science Museum of Virginia, Richmond (2014); The Tech Museum, San Jose (2015); Ontario Science Centre, Toronto (2016) and McWane Science Center in Birmingham, Alabama (2018). "These demonstrations illustrated how the ESX and Digistar systems could be used to fulfill the USSRC's mission," said Johnson.

Once the Rocket Center was ready for bids, things moved quickly. "We began the bidding process in January of 2018 and signed in May," said Johnson. "The dome installation was completed in December of 2018, and system install was in February, followed not long after by the grand opening."

by themed entertainment operators for immersive, media-based experiences, and by museum and science center operators as a versatile replacement for aging giant-screen film dome systems. E&S has actively worked to fill the latter need with many successes, many of which use Christie projectors. The INTUITIVE Planetarium is one of the newest examples.

Journalist David Hitt summarized it aptly in his report on the new planetarium for Huntsville.org. "...the Rocket Center's Space-dome IMAX theater...was state-of-the-art itself when it opened more than three decades ago. It had its own impressive bit of technology—a 70mm projector that went on to be one of the last of its kind. Visiting the IMAX theater for classic space movie like *Hail Columbia* and *The Dream Is Alive* was a rite of passage for generations of students in Alabama and beyond. It would take something special indeed to live up to that legacy. The INTUITIVE® Planetarium is up for the task."

"The U.S. Space & Rocket Center wanted to replace their aging partial dome 1570 film with a top-of-the-line 8K digital system," said Johnson. "E&S designed, engineered, and integrated the system in their facility, as well as provided training and ongoing support to help USSRC bring astronomy and science education to audiences of all ages."

Of the many benefits cited for the new system, a very noticeable one, is reclaiming the sweet spot for audience use. The five

new projectors are installed in a ring overhead, replacing the single, massive film projector that formerly sat in the middle of the auditorium. As Johnson said, "One benefit of the redesign was the ability to add premium quality seats in the center of the theater after the IMAX projector was removed."

### Projector bragging rights

Christie has rolled out two models representing its second generation of RGB laser technology: the Mirage SST and D4K40-RGB. These are the result of considerable market research and R&D aimed at raising the bar in many respects and designed to appeal to large venues, planetariums, and domes. (The D4K40-RGB is the all-in-one model installed at USSRC, whereas the Mirage SST has a more compact head and remote light source.) The product literature touts 40,000 lumens; all-in-one, energy efficient design; long lifespan and minimal maintenance; small form factor with no external chillers; optimal illumination performance of 20,000 hours to 60% brightness; 5000:1 contrast ratio, frame rate up to 120 fps; new, patented, sealed optical path; operating on single-phase 220V power and ability to deliver more than 90% of the Rec. 2020 color space.

"From a user standpoint, the difference in color performance is very noticeable," said David Weigel, USSRC planetarium director. "You can pick out every single star in a star cluster. I have noticed that the color range on the screen can't be quite reproduced in photos—people's everyday cameras don't have the same range as these projectors."

Along with color, there are brightness and uniformity. Said Johnson: "The combined brightness of the five projectors off the Spitz

*(Continues on next page)*

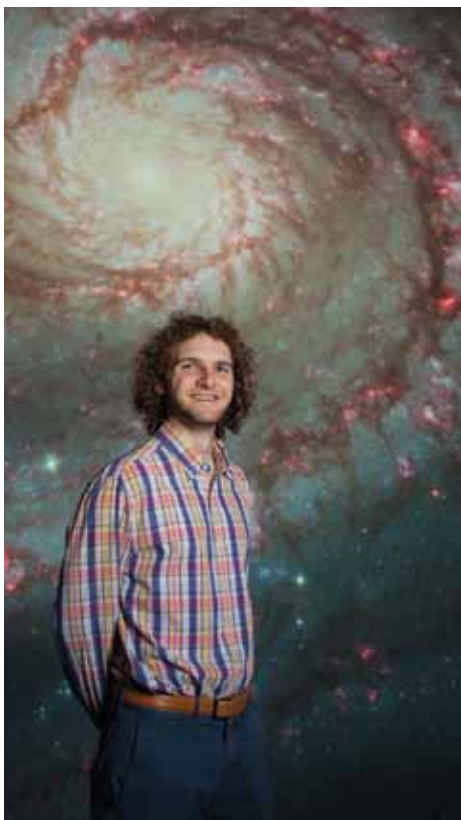


Having fun at the USSRC during the VIP Evening.



NanoSeam was measured by our technicians at 4.5 foot-lamberts. This brightness is uniform across the entire dome image. The system brightness does not drop off nearly 50% towards the edges like a traditional film or single digital projection system does."

"The projectors are amazing," said Weigel. "The depth and vibrancy of color and the clarity they provide are fantastic. The image is super bright, and yet the contrast is great. The brightness is to the point where people can take flash photography and it doesn't ruin the experience for others. We can fully light the stage for special events and you really don't lose that much on the dome at all because of



David Weigel, USSRC planetarium director, whose second day on the job was the new planetarium's ribbon cutting. Photo by Steve Babin

the super bright projection," adding that "the surround sound system can really rock the house."

Johnson said, "E&S works closely with Christie as they develop new projector technology. We not only have relationships with the sales team, but we maintain relationships with Christie engineering and product management and service. This close working relationship has enabled us to offer brand-new technology right off the production line and into USSRC's theater."

"E&S is very hands-on and knowledgeable, especially in the planetarium space," said Boyer. "Because it was a new product, prior to this install there was a lot of education up front, a lot of conversation between Christie's project manager and the E&S tech team, as well as training on laser safety. This product is based on our TruLife electronics platform, and E&S is very familiar with that and how to interface it with the Digistar 6 configuration."

The compact form factor, omni-directional function and lampless, solid-state construction are all held up as significant benefits to installation and operations, by supporting non-standard mounting positions (within laser safety guidelines).

That can be a critical factor for new construction as well as a retrofit. Larry Howard, director of sales, Entertainment at Christie said, "The optimal positions for mounting projectors in a planetarium are sometimes very steep, odd angles. That's no problem at all with the D4K40-RGB." Software tools, he points out, have eliminated the issues of blending and alignment that used to raise concerns about replacing one projector with several and mounting them at odd angles.

Boyer said, "Some projectors on the market can't tilt over a certain degree. If you tilt a xenon bulb past eight degrees, you will start seeing flicker from the lamp trying to maintain the arc. The D4K40-RGB is designed to be used at any angle or tilt, landscape or portrait mode."

## The conversation on color and cross-reflection

Christie is keen for users to understand the leap in color capability facilitated by RGB laser and has published resources online, including the white paper by color scientist and entertainment specialist Matt Cowan, co-founder of Entertainment Technology Consultants, available at [www.christiedigital.com/techpapers/rec-2020-whitepaper.pdf](http://www.christiedigital.com/techpapers/rec-2020-whitepaper.pdf) and a free e-book, *Illuminating ProAV* available at [christiedigital.com/illuminationguide](http://christiedigital.com/illuminationguide). Christie also hosts color demo shootouts for first-hand, real-life comparison viewing of three color gamuts: Rec. 2020 (facilitated by RGB laser) vs Rec. 709 (associated with HDTV) and P3 (associated with DCI, the Digital Cinema Initiative).

Cowan describes Rec. 2020 as a superior color space in terms of representing the real world and achieving precise color matches that can reproduce colors not possible with Rec. 709 or P3. He writes, "Rec. 2020 color provides the opportunity to display a better representation of real-world colors than the commonly used color spaces for television and cinema. The standards committee for Rec. 2020 chose color primary coordinates that are at the extreme edge of the visible color space...RGB laser illuminated projectors are ideal for achieving this."

RGB laser projection can deliver this expanded color space, but laser phosphor projection cannot. Both are lampless projection technologies; the key difference is how the light is produced. Laser phosphor uses blue laser diodes as the primary light source, generating the three primary colors by shining the blue light of the diodes onto a spinning wheel coated in a phosphor compound. The blue light excites the phosphor, emitting yellow light; dichroic coatings are used to further segment the colors.

RGB laser is lamp-free, wheel-free and solid state. It employs individual red, green and

(Continues on page 36)

## **CHRONOS II has a new blue home**

On July 5, 2019, the new Galileum Planetarium in Solingen Germany was officially opened with a series of enthusiastic community celebrations. The road to that opening began in 1921, when local high school science teacher Walter Horn formed the Astronomical Club of Solingen, which built a small observatory. The Walter-Horn Society has continued serving its community for nearly 100 years, and now its members embark on the next 100 years of sharing the wonders of the cosmos.

The fundraising that created that first small observatory was repeated on a much larger scale in the past decade. Hoping to build a planetarium, the club obtained land and an unused, 62 year-old gas storage tank for use as their new home. Various governmental agencies provided roughly 2/3 of the funding, but club members had to do an amazing amount of work to raise the rest. After years of crowdfunding appeals, performances of a famous German science comedian, approaches to local corporations, and even selling various promotional items, finally construction began in 2016.

The 85-seat planetarium features a GOTO CHRONOS II HYBRID system which links a 4K RSA Cosmos Sky Explorer 4.0 fulldome system with the beautiful, ultra-high resolution stars, sun, moon, and planets of the opto-mechanical projector. Programming is a mixture of live performances in which club members utilize the GOTO HYBRID control console to give tours of the night sky, automated HYBRID programs, pre-rendered shows on diverse topics, and even alternate uses such as live concerts and other community presentations.

An 8-story tower building was constructed beside the tank, with a bridge leading into the tank at its equator. Atop the tower are 35.5cm and 25cm telescopes which have a totally unobstructed view of the entire horizon. Inside the tower are meeting rooms, offices, the society's library, a small café, and exhibits. And inside the 26 meter tank is a 12 meter, horizontal Astro-Tec dome housing what is arguably the most exciting planetarium in Europe.

For as long as most people could remember, the big steel ball near the Solingen Hbf train station was just an industrial oddity. But now it has become the icon signaling an exciting new future for the Galileum Solingen!



\* Background Photos: Courtesy of Norman Schwarz, Galileum Solingen



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**GOTO HYBRID PLANETARIUM**  
**CHRONOS II**

## INTUITIVE Planetarium, continued from page 36)

blue laser diodes as its light source, and they are scalable. The scalability supports ever increasing levels of brightness and the individual, primary color diodes support the Rec. 2020 color palette.

A longtime bane of dome projection is cross-reflection. The concern that brightness will create cross-reflection in a dome theater often leads to specifying projectors of relatively low lumen output. "Based on extensive testing done using Christie projectors in contemporary dome environments, we are comfortable with higher brightness in today's planetarium settings," said Howard. "Thanks to new technology, we can set aside some of the old specs from decades ago and stop dancing around cross reflection."

### Loving it live

Weigel's approach to planetarium programming emphasizes real-time, in-house custom content and audience participation and reflects his own, palpable enthusiasm for astronomy and space science. "Live shows connect with audiences in a way other programming can't," he said. "I try to engage with the audience as much as possible. We want to give them something high end, but

also to keep things current and cutting edge—an experience that is welcoming, engaging, entertaining and educational without feeling like a lecture or a tour guide. We're all in it together, learning and sharing the excitement, being wowed by the sheer awesomeness of the universe."

In the months since opening, Weigel has been on a journey through the Digistar 6 universe of tools and resources to produce a steady stream of live shows, while also dipping into libraries of pre-rendered shows for fulldome exhibition.

Enumerating some key features, Johnson said, "Digistar combines image quality, simulation power and ease of use. Planetarium shows can be developed quickly and seamlessly with the Digistar 6 show builder. Users have access to comprehensive and frequently updated astronomy data and can share content in the Digistar Cloud. There is also an extensive library of science and STEAM content, connectivity to live scientific data feeds and support for 3D and virtual reality."

Weigel's experience with Digistar 6 would bear out Johnson's description. Weigel's first day on the job as INTUITIVE Planetarium director was February 27, 2019—one day

before the ribbon cutting. He brought with him a wealth of experience using World Wide Telescope but only limited acquaintance with Digistar. Nevertheless, on February 28 there he was—creditably and confidently enough—demonstrating Digistar 6 to a VIP audience. "We flew live with an X-box controller and did a brief tour of leaving the Earth and going to the moon, and it was very well received."

Weigel named a few highlights of shows created with Digistar 6 since then, including "a nice ball-of-yarn visual and a very realistic spacecraft flyby in a show on the Cassini mission to Saturn," "an exoplanet show done when NASA's TESS satellite identified two new ones; we had locations of where those planets were and could travel to the star and show locations," and "bringing into the dome the first picture of a black hole; we brought in some simulations and had them oriented so you could go between our simulation of it, a magneto hydrodynamic (MHD) simulation of it from the European Southern Observatory, and the actual released image from the Event Horizon telescope. We had that first picture of a black hole the same day; that was a big deal, a near real-time transition of taking data and bringing it into the dome. We also created a volumetric rendering of M87 as an elliptical galaxy, with a black hole at the center, using tools in Digistar. From a scripting standpoint it is very, very powerful."

Weigel brought in some new presenters and content creators, and trained some of the existing staff, adding up to a core staff of five full time people plus several part-time. "Every single Friday we have a unique presentation that we've basically been working on for the week," he said. "Evening programming is almost exclusively our own content. Thanks to Digistar and the amazing new projectors, the visuals we are presenting are stunning."

Along with its investment in the planetarium, INTUITIVE (the company) is the Apollo 50th Golden Anniversary Sponsor for all U.S. Space & Rocket Center anniversary activities. At this writing, programming celebrating the 50th anniversary of Apollo 11 and the moon landing was fully underway, including a distinguished panel presentation with Apollo-era scientists and engineers, moderated by Weigel, who is clearly loving his profession. "It's a neat thing to be a part of and a ton of fun."

"This is the finest investment INTUITIVE could have made in our community for space education," said Dr. Barnhart. "This is an investment for decades to come." ☆

## Illuminating our Audiences, continued from page 36)

cation or the show, not them. We might also try to adopt and convey a problem-solving mindset in which our audiences are partners rather than just reactors. From this standpoint, having and sharing an opinion be helpful, not judgmental.

We can be more adventurous in our topic selection and how we treat tricky topics because audiences are drawn to technical topics even if they may be harder to grasp.

While the topics that people found interesting varied, we see aurora formation was overwhelmingly identified as the most interesting topic, specifically the part of the process involving solar winds and the sun's magnetic field. Encouragingly, this is true even though aurora formation was also singled out as one of the top difficult concepts. Taken together with our previously published results, these studies suggest that we might be more adventurous in what we present in the planetarium and in other public forums.

Not only did our data show that complex and unfamiliar ideas can be successfully communicated to a general audience without "dumbing it down" (as seen in Creighton,

DeVasto & Gallagher, 2017), but it also shows that people find these technical topics interesting.

So, contrary to the assumption that people prefer easy material, we see that "they are thoughtful and curious about topics of every kind...Everyone is capable of deep understanding" (Bogost 2018).

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Dr. Jean Creighton loves to think about how best to communicate astronomical concepts to everyone; she directs the University of Wisconsin-Milwaukee (UWM) Planetarium: [jcreight@uwm.edu](mailto:jcreight@uwm.edu)  
Dr. Danielle DeVasto studies the communication of experts with the public; she did this work as a Visiting Assistant Professor in the Rhetoric and Professional Writing program of the UWM English Department: [dmhartke@uwm.edu](mailto:dmhartke@uwm.edu)

Judith Rubin ([rubin.judith@gmail.com](mailto:rubin.judith@gmail.com)) is an independent journalist and publicist who writes often about specialty cinema, entertainment technology and visitor attractions.



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# Katherine Johnson's legacy lives on: As name of NASA center, As inspiration to students

White Sulphur Springs, West Virginia. Katherine Johnson describes marching down Church Street to the railroad tracks and turning left on Barton Road to the school to help her brother with his math when she was 4 years old in her autobiography *Reaching for the Moon*. Google Maps.

By Sharon Shanks  
*Planetary* Editor

There's a town in West Virginia called Fairmont that is typical of a host of other small cities throughout the state. It is centered on the spot where the Tygart Valley River merges with the West Fork River to start the mighty Monongahela, which folks in neighboring Pennsylvania call The Mon and which terminates in Pittsburgh at a point that gave Three Rivers Stadium its name (forming, when merged with the Allegheny, the Ohio River).

It is perched on the typical Appalachian geography of hills and rises, where steep roads make driving in the winter a thrill and the local fire department is challenged to do its job. Most of its buildings are brick, some lovingly-tended and restored, others showing signs of a depressed economy. Again like many other cities of its age, its downtown area had to be reconstructed after a devastating fire in 1876. And, from personal experience, there is the fantastic 3-floor Arts & Antiques Marketplace that has given new life to a former furniture store.

In addition to its charm, Fairmont is home to an enigmatic place called the IV&V Facility. Even though it is tempting to call it the "4&5," locals know it as much more: the NASA Independent Verification and Validation Facility, the place where NASA assures the safety and success of software on NASA's highest-profile missions. It is the hidden mathematical soul in the heart of Appalachia.

And now it honors a West Virginia mathematician with a heart and soul of her own: Katherine Johnson.

The center held a "redesignation" ceremony on July 2, setting up a ribbon cutting,

hosting a reception, and featuring talks by all of the officials you'd expect at one of these events: NASA Administrator Jim Bridenstine, former astronaut and NASA executive Fred Gregory, and West Virginia local, state, and U.S. representatives and senators.

Guests of honor were two of Johnson's daughters, Joylette Hylick and Katherine Moore.

## The students take the spotlight

The most significant celebrities for the event, however, were at tables and displays at the back of the room. They were the true beneficiaries of Katherine Johnson's passion for mathematics and her determination to overcome obstacles: the student teams that were sponsored by the IV&V's Education Resource Center through financial assistance, facility resources, and educational workshops.

The students created their own spectrum of ages: from 6-year-old first graders involved with the DynamicBots First Lego League to 18-year-old high school graduating seniors with Unnatural Selection, a FIRST Tech Challenge team that competed in the FIRST state championship.

Most were middle-school age—those 10- to 14-year-olds who seem to be that perfect age to absorb and focus on the science topics that capture their interest and who consistently surprise adults with their abilities.

Katherine Johnson, a teacher and graduate student before she was hired National Advisory Committee for Aeronautics' (NACA's) Langley laboratory, probably wouldn't have been surprised and certainly would have been

pleased to see the students' achievements.

"She never took 'no' for an answer and would help anyone who needed help," Joylette said of her mother.

Katherine was born in White Sulphur Springs, West Virginia, in 1918. The town, famous for its Dandelion Festival, is about 150 miles south of Fairmont as the crow flies, or about 170 miles and 3 hours if you take Interstate 79 and don't hit construction. You can learn more about her life (she helped her older brother with his math homework when she was 4) and journey to become a "hidden figure" in a variety of sources on the internet. As interesting as it is, her legacy, not her history, is the topic of this story.

## For the students at the IV&V

Todd Ensign from the IV&V ERC described some of the work the center does to train teachers, including the use of portable planetariums that they are able to borrow. The program has four domes available, one of which is digital.

The ERC is partnered with Fairmont State University. Of its goals, the major ones are to "provide resources and training opportunities to prepare thousands of excellent new K-12 teachers by 2020, and support the existing teacher workforce. The ERC provides in-service, pre-service, and informal educators with an easily accessible source of materials that reflect NASA's current research and technology in Earth and space sciences.

In addition to mentoring many of the student robotics groups in attendance, the  
(Continues on page 40)



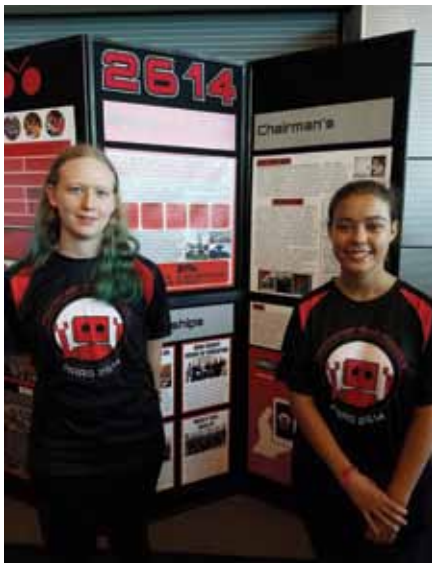
The official things. Top, the IV&V facility with its new name. Below, left: Cutting the ribbon are (from left) Katherine Moore, daughter of Katherine Johnson; U.S. Sen. Shelley Moore Capito of West Virginia; Joylette Hylick, daughter of Katherine Johnson; and U.S. Rep. David McKinley of West Virginia. Below, right: it was a family affair for IV&V Director Greg Blaney (on the right), who introduced his father, Joe Leech, a Korean War veteran, to NASA Administrator Jim Bridenstine. Blaney noted during the reception that four generations of his family had been influenced by the work of Katherine Johnson. All photos by the author.



Two attendees of the rededication ceremony were there just to meet Katherine's daughters, Joylette Hylick and Katherine Moore. Junior Girl Scouts Josephine Audia and McKenna Earle traveled from Morgantown and brought with them Josephine's birthday gift, a Katherine Johnson doll released as part of the Barbie Inspiring Women Series.

They spent considerable time before the ceremony speaking with Katherine Moore (on the left), who was happy to sign the doll's box. Katherine also announced that the day was special for her, as well, because her mother's autobiography, *Reaching for the Moon*, was being released that day. It is written for readers just the age of Josephine and McKenna.

Both girls are 9 years old and are fourth graders at Mountainview Elementary School in Morgantown. Josephine said she would like to pursue aerospace engineering as a career, while McKenna said she'd like to be a psychologist. "I care about what people think and feel," she said. "I like to give hugs."



Kendra Gillo (left), a senior, and Anna Brusoe, in ninth grade, were two of the representatives of the Mountaineer Area Robotics (MARS) First Robotics Team. The FIRST Robotics Competition is an international high school robotics challenge. Each year, teams of high school students, coaches, and mentors work during a six-week period to build game-playing robots that weigh up to 125 pounds. The MARS team has been winning awards since it started competing in 2008.

Kendra said she's personally not interested in pursuing a career as an astronaut or engineer. Anna, on the other hand, said that as

a freshman she's not sure yet, but she is interested in engineering, just not which kind yet. Both agreed that the problem solving and team building aspects of the FIRST program will give them advantages when they get to college, and both have skills now that others will not. "We already know how to do these things," Anna said.

The CyberPatriot middle school group from Morgantown Learning Academy, represented here (from left) by Khensu, Hayden, and Braedyn, was the West Virginia state CyberPatriot champions at the CP-XI competition and the first middle school group to make it to the semi-finals. CyberPatriot, is an outgrowth of the Air Force's Civil Air Patrol, is a national youth cyber education program created to help direct students toward careers in cybersecurity or other science, technology, engineering, and mathematics disciplines.



Khensu's mother, Sharda Mohammed, is one of the coaches for the group. She had nothing but praise for the NASA Educator Resource Center located at the IV&V center.

"There's lots of cooperation here" between the student groups themselves, and with the ERC."

For example, in 2017, the IV&V ERC and Fairmont State University coordinated 11 robotics programs, with 42 tournaments hosted across the state. More than 420 K-16 level teams are participating in more than 36 West Virginia counties.

# A planetarium is reborn in Coshocton

Dr. David Hurd  
Planetarium Director, Edinboro University  
Edinboro, Pennsylvania  
C. Ron Derewecki  
Retired Earth Science Teacher, Coshocton City Schools  
Coshocton, Ohio

Beginning in 1962, Coshocton City School students in Coshocton, Ohio had the benefit of a unique educational experience that eluded many students within the state. A planetarium was constructed and housed within the Central School building, that first served as a high school and later as a middle and elementary building.

The planetarium was much more than an awesome place to view the planets, starry constellations, and heavenly bodies in the night sky. The math and science curriculum for senior high and middle school was greatly enriched by the planetarium experience, and for some it was the catalyst toward a career path in astronomy or the sciences.

For countless numbers of elementary students the planetarium was an awe-inspiring extension of the basic curriculum which helped set a strong foundation upon which future studies in the sciences were built. Additionally, visiting educators and the general public shared the rich programming of this facility, thus establishing its asset value to the school district and community.

In 2013, the former planetarium director, Ron Derewecki, and the Board of Education, recognizing the value of the planetarium, hired Ash Enterprises to dismantle and store the equipment since Central Elementary was to be razed following construction of the new Coshocton Elementary building.

A space within the high school to house the planetarium was found and an architect hired to render plans and drawings to again make the planetarium fully updated and operational.

A citizen's committee took on the task of securing the required funding for this project. They realized that the support of local foundations, businesses, social clubs, and private individuals would enable this remarkable asset to once again extend and enrich the educational curriculum and experiences of the community.

A funding goal of \$400,000 was needed to cover the cost of renovations and upgrades to the planetarium. This amount would be neces-



sary to enhance programming and enable the students and community to again benefit from this valuable community resource.

Ash Enterprises again was hired to power wash, repaint, and hang the original dome. They also installed the original A3P Spitz projector, a new East Coast Control panel, a 5.1 sound system, a Warped Media Full Dome Projector, Chroma Cove Lighting System, and new seats. Additionally, a climate control system was installed.

The Coshocton Planetarium was reopened on April 11, 2018. Since opening, it has hosted school groups, the general public, and VIPs. On April 27, 2019, the planetarium hosted the Great Lakes Planetarium Association's state of Ohio meeting. Guest speakers, paper sessions and even a live program for regional children made the day very inspiring.

In the midst of budget crises, misguided priorities, and lack of support on many different levels, some planetariums around the world are struggling to stay open. Coshocton Planetarium is a shining example of what can happen when the community rallies behind impactful education experiences.

The leadership of Ron Derewecki is noteworthy and our hope is that you will reach out to your community to renew or, in some cases, begin support for planetariums that may be on the brink of the proverbial storage closet.

*Co-author Dr. David Hurd is a resident of Coshocton, Ohio, and a member of the citizen's committee.* ☆



Members of the Dynamic Bots, a First Lego League Jr. robotics team made up of elementary students in grades 1-4. The junior program is a non-competitive program that has teams conduct research and make models and programs from LEGO elements to illustrate them.

NASA Astronaut Yvonne Cagle, one of the guests of honor at the redesignation event, autographs a rocket for a student.



## Katherine Johnson, continued from page 38)

ERC helps to coordinate tournaments.

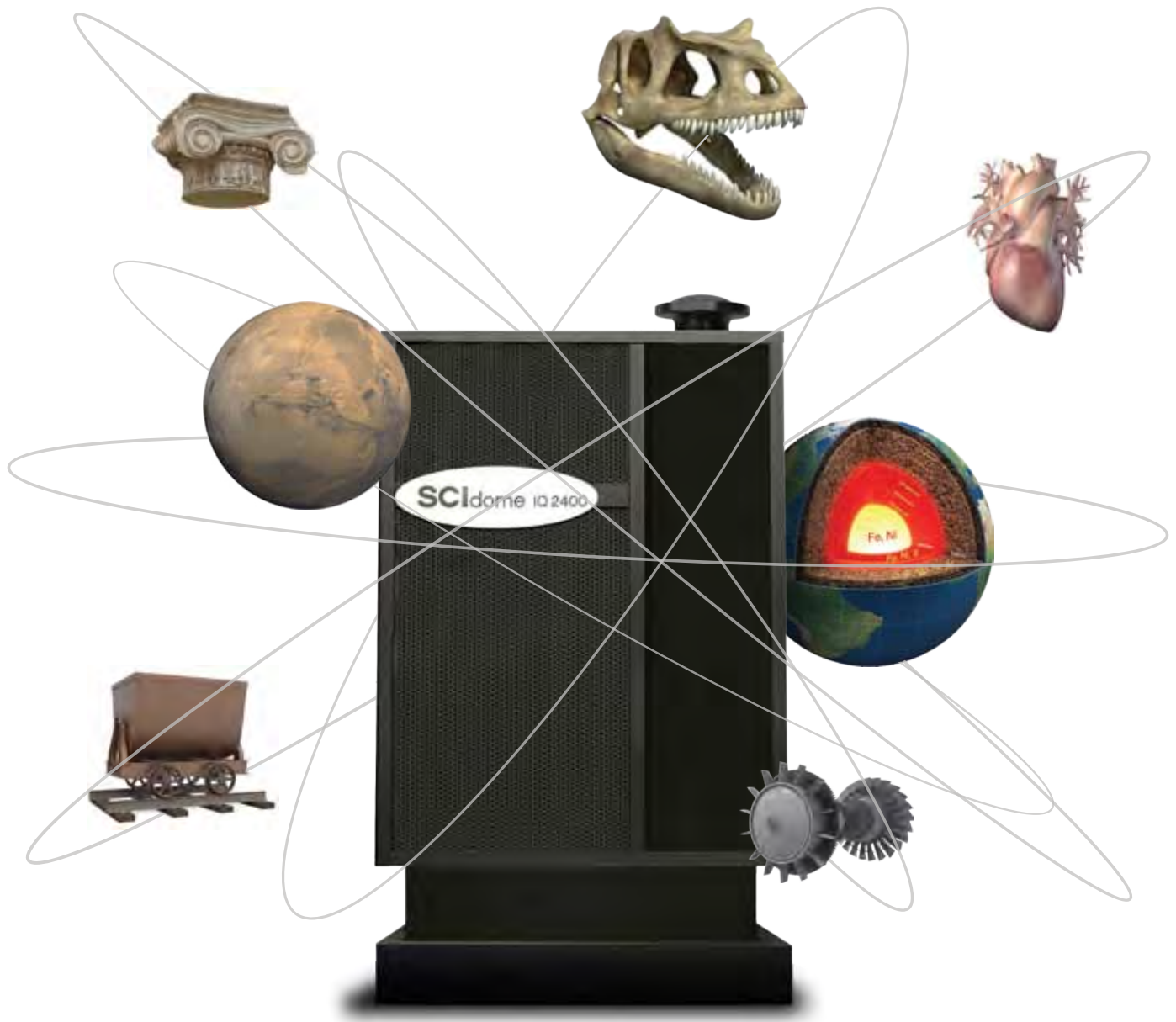
From their website:<sup>1</sup> The ERC staff provides free workshops both on-site and partner hosted as well as annual summer institutes for educators on a variety of topics to supplement the curriculum and help meet national and state educational standards. Topics include Aeronautics, Astronomy, Engineering Design Challenges, Mars, Moon Rocks and Meteorites, Planetary Geology, Podcasting, Rocketry, Robotics, or any NASA educational product.

The ERC is also the WV Partner for the GLOBE Program and provides teacher certification workshops in the areas of Hydrology, Soils, Atmosphere, Land Cover, and Seasons, as well as training in Global Positioning System (GPS), remote sensing, and the latest Geographic Information System (GIS) tools.

"Once an educator has completed training, they are certified to borrow one of our 50+ classroom kits including portable planetariums, GPS units, robots, engineering challenges, and much more to increase the number of youth who have an authentic educational experiences." ☆

<sup>1</sup><https://www.nasa.gov/centers/ivv/education/educators.html>

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# MARS

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ONE THOUSAND ONE

“I never **thought** I’d live  
to see this day.”

Reporter Miles O’Brien



Régis Plichart  
Chair, Proscience  
Papeete, Tahiti  
French Polynesia

The association Proscience (Te turu 'ihi) is a non-governmental association created in 1992 to promote science and technology in Polynesia by organizing events to publicize the world of science to the public and to promote scientific vocations among young Polynesians.

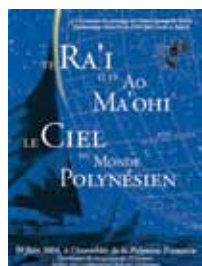
For many years, Proscience was in charge of organizing the Fête de la Science (FDS), a national event organized in all regions of France and overseas.

Since then, the association has diversified its actions that can be found on the website [www.proscience.pf](http://www.proscience.pf).

### The dome ideas started in 2004

On 19 June 2004, during a transit of Venus unfortunately not visible from Tahiti, Proscience organized the Journée du ciel polynésien (Day of the Polynesian sky) to remind that James Cook had come to observe the 1769 transit in Tahiti.

This day, mixing history, sciences and



culture, met a completely unexpected success, demonstrating the interest of the population for the sky and the stars it contains.

From there was born the project to provide us with a new educational tool: a portable planetarium. After researching what was then the best choice for them, Proscience acquired, in 2006, our first portable planetarium: a Cosmodysey IV (RSA Cosmos-France)

Our goal was to satisfy the request of the population who wants to better understand the functioning of celestial mechanics and its strong desire to reclaim the ancestral navigation techniques of the ancient Polynesians.

### Rua 'ana, the adventure begins

For the next 14 years, the 5-m dome and the entire sky simulation system traveled to most schools and communities in Tahiti and remote archipelagos.

Each time, the planetarium and its presenters met with renewed success. The visitors queue was so long that, very quickly, we had to develop an astronomy workshop to keep the waiting audience occupied. The themes addressed during these digital anima-

tions, both scientific (general astronomy) and cultural (mythology and Polynesian navigation), met the same success as the planetarium itself.

Our Cosmodysey, named Te rua 'ana (the cave of stars), has amazed many thousands of children and adults during its 14 years of hectic life.

### Te Rua 'ana 2: beautiful journey

In 2015, we decide to replace our venerable Cosmodysey with a digital system that would be more modern and also more in line with the pressing public demand for more imagery about the functioning of the solar system, our galaxy, and the universe.

This is how our new planetarium (funded solely from Proscience's own funds) arrived in February 2018, to the delight of our small team.

Under a 5.5-m Quim Guixà (Barcelona-Spain) dome with 24 seats, the average size of a school class, the sky is generated by the SpaceCrafter software (Immersive Adventure-Barcelona) installed on a liquid-cooled Linux computer hosting a NVidia 1050 graphic card.



Facing page: Marina Taina at Papeete; ©Rémi Jouan, CC-BY-SA, GNU Free Documentation License, Wikimedia Commons. Inset, the Proscience staff is delighted by the new dome. This and the rest of the images provided by the author.

The image is projected by a Barco F22 projector (resolution 1200 pixels, brightness: 3.300 lumens, contrast: 2500: 1) and redirected onto the vault by an optical block manufactured by Immersive Adventure.

The backlit “customized” keypad and the MasterPut software installed on a touch pad (Windows 10) both help the animator to taking advantage in using the countless software features and video sequences provided by Immersive Adventure.

This set, with a reasonable cost suitable for a small association like ours, offers striking results exceeding our hopes. With Rua ‘Ana 2, Proscience moved into the era of digital planetarium.

Like the previous one, Rua ‘Ana2 allows us to observe the starry sky wherever we are on Earth and at any time but (the first major improvement) it permits us to leave the Earth and observe our world and the moon from the sky, to fly over the planets revolving around the sun, to visit our galaxy, and even to go to the confines of the known universe. Such an evolution was immediately appreciated and acclaimed by the public! Today, our only concern is the availability of rooms in which to deploy our dome.

With its 6.5 m outer diameter (plus 3m for a safety corridor) and its 3.5 m height, the T5 dome is not easy to fit. In Polynesia, the large rooms are few, and their owners hesitate to invite an ever-increasing audience.

In addition, the room must be very clean and well air-conditioned to prevent the audience from melting!

## Demand for dome continues

From the very first sessions, our interactive presentations have been acclaimed. The public has become more and more numerous and schools are constantly claiming for new “planetarium sessions”!

Between March 2018 and May 2019, we hosted 730 sessions (24 people maximum per session) and recorded not less than 6,290 spectators.

In total, we trained about fifteen presenters, but, now, our group works with only 4 reliable volunteers. Others have been overtaken by their professional and family obligations and can only rarely participate. It is a hard job for the volunteer, but so rewarding and exciting!

Proscience’s approach is resolutely scientific. However, how can we not take advantage of this tool to understand how ancient civilizations used the stars as landmarks to travel or how they placed images (constellations) as supports for their history, their myths? We often work with cultural associations to find ancestral methods of navigation and train our traditional sailors to discover and reclaim the high-ways of the sky.

During our sessions, we regularly discuss the journey of Cook, the transit of Venus, the legend of Pipirima, the Polynesian seasons, and much more.

The mobile planetarium of small capacity promotes exchanges with the public and allows very interactive sessions, for the benefit of all. ☆



From top: waiting for their turn in the dome; the new Immersive Adventure system; working with the venerable Cosmodyssey, which delighted audiences for 14 years.



Since 2015, the Proscience association is chaired by Régis Plichart. Coming from the world of biology, medical research and computer science, Régis Plichart is 65 years old and now retired. Very active in the association since its creation, he organized various scientific competitions, several editions of the Science Festival (FDS), several punctual events and is the initiator of the “Planetarium” project and working as a presenter and a trainer of presenters. He also participates whenever possible in the annual meetings of the APLF, of which he is a member, but not yet at the meetings of the IPS. Today, his immediate ambition would be to successfully bring together a community of small digital planetariums in the South Pacific to share with friends the know-how, the tricks, or even the scripts when the systems are compatible. We often have to adapt our tools written for the northern hemisphere and it makes sense to work together.



Carolyn Collins Petersen  
Loch Ness Productions  
Post Office Box 924  
Nederland, Colorado 80466 USA  
+1 303-642-7250  
carolyn@lochnessproductions.com

## What we did on our summer vacations

Although the business of fulldome and immersive production and presentation continues year-round, summertime often brings most of us a chance to broaden our scope through study, travel, and other past-times. IMERSA Board members, ambassadors, and advisors spent the summer of 2019 doing just that, from festivals in Canada and Europe to research into new methods that can ignite our presentations and delight our audiences.

To start with, I spent much of my summer doing a deep dive into the “Disney method” of production and storytelling techniques used by Disney Imagineers in their productions and parks. It all began with a talk I heard some years ago at an American Association of Museums meeting about ways to fire up museum exhibits, shows, and business practices. Then, over the years, through various field trips to Disney World (including one this past February) and a just-completed field trip to Disneyland Hong Kong, I have been immersed in a serious study of their practices. It’s all knowledge that is very applicable in the writing, design, and production of immersive shows, fulldome content, and exhibitions, and I look forward to sharing that knowledge in future projects.

### FilmCon and the dome

In our last column, fellow IMERSA Board Member Michael Daut talked at length about creativity and storytelling—two topics over which he and I are in agreement as kindred spirits and which we both continue to explore as we work on new projects. To that end, Michael was invited to speak at Film-Con <https://film-com.com> in June, at a venue where Hollywood executives and distributors descend on Nashville to share insights, advice, and receive creative pitches from aspiring students and seasoned professionals alike. Hundreds of people attended the event, which celebrated its 10th anniversary this year.

As part of the conference, Michael gave a “Dome-Com” presentation in the digital planetarium at Adventure Science Center. He had the opportunity to introduce notable members of the Hollywood entertainment community to nearly limitless potential of the immersive medium, likening digital fulldome to a shared VR experience without the glasses. He presented a montage of clips from exemplary fulldome work, a keynote talk that covered the history and future of the medium, and a complete screening of *Microcosm: The Adventure Within* as an example of the first science fiction film that used cinematic cuts in addition to long sweeping “first-person” shots. Delegates received the session warmly and clearly understood the phenomenal potential of the medium to uniquely engage and captivate an audience.

### IMERSA at SAT IX Symposium

Board Member and IMERSA Executive Director Dan Neafus (Denver Museum of Nature and Science) and IMERSA Ambassador Monica Bolles represented our group at the SAT IX festival in Montreal. This yearly event comprises a look at all types of immersive spaces and

the pieces produced for them. The IX Symposium celebrated its sixth edition, held once again at the Société des Arts Technologiques (SAT), from May 29- June 3. This year, the symposium focused on providing cutting edge workshops in topics from AR/XR to Spatial Audio to Big Data and Interaction. “I personally attended the Rapid Prototyping of an Immersive Audiovisual Installation and the Spatial Real-time Spatialization workshops,” reported Monica. “Both were full and were hosted by leaders in the immersive and spatial audio fields. The work-



David Rokeby, avant-garde installation artist from Toronto, offering a keynote presentation at SAT IX with insights into his immersive work and the mind-body-machine connection. A frame from the immersive presentation called “Hazards,” performed at SAT IX. Courtesy IMERSA/Monica Bolles.



shops took over the whole day and gave everyone plenty of opportunity to take a deep dive into the topic they were covering.”

The evening sessions were taken up with a series of immersive fulldome performances in the Satosphere, the SAT’s dome. Monica reported that one of her favorite performances was called *Hazards*. The performance consisted of the audiovisual collective ALEA, consisting of illustrator FSTN, analog synth musician Shakmat, and motion designer Boris Wilmot. “The performers set up near the center of the dome, providing people an opportunity to stand around them and witness their performance,” she said. “FSTN ferociously drew chalk images on paper while Wilmot captured the images and projected them in creative ways onto the dome as Shakmat filled the space with heady electronic synth beats and melodies. The energy of the perform-

Carolyn Collins Petersen is an IMERSA board member and communications coordinator. She also is CEO of Loch Ness Productions. She can be reached at [carolyn@imersa.org](mailto:carolyn@imersa.org).

ers was fascinating to watch and the outcome was delightfully interesting."

The symposium only hosted two keynotes this year, one by Samuel Biancini, artist and lecturer at the National School of Decorative Arts, and one by David Rokeby, prolific artist of the digital avant-garde. As useful as the formal presentations were, the "informal networking" possibilities provided attendees with multiple opportunities to share ideas and passions. "While I did miss having a few more talks and panels," Monica said, "my favorite pastime of sitting out on the SAT terrace while having a beer and diving into deep and provocative conversations was just as pronounced as always. The connections and conversations created at the symposium are always one of the best parts of the experience. I look forward to next time."

## IMERSA at Brno

The Fulldome Festival Brno in the Czech Republic was held from June 5-7, and featured 49 shows over the course of the four-day event. Nearly 200 attendees took part in the festival, which is an annual celebration of the best of fulldome. Director Jiri Dusek and his team graciously arranged a special "IMERSA Day" just prior to the start of the festival. The IMERSA team embraced this opportunity to network and support the international fulldome community. Executive director Dan Neafus and board member Michael Daut started things off with an introduction about our organization. Neafus then presented commentary during a series of memorable fulldome excerpts from popular and rarely seen fulldome films from the past decade.

Michael Daut's high-spirited talk "Creating Impact Through Emotional Connection" featured touching examples and generated much discussion among the group.

We were also very pleased to be able to present a discussion with show judges and show operators about "What Makes Fulldome Sensational?" Panelists included Maciej Mucha, owner of Plafinder.com and past head of the Heavens of Copernicus Production Studio; Kimura Kaoru, IPS president-elect; Shawn Laatsch, IPS past president; and Pavel Karas, Brno's head of program coordinator. We learned how they select shows to meet their audience expectations and what they look for when judging a festival.

In addition to carrying the IMERSA message to our colleagues in attendance at Brno, our main aim in this event and others is to continue our tradition of connecting diverse groups within fulldome, immersive, and themed entertainment communities.

## See you in Edmonton in 2020

As part of our affiliation with IPS, the IMERSA Board has accepted an invitation to present an IMERSA Day at the biennial meeting in Edmonton, June 21-25. This event is our way of acquainting people in the domed community with our organization. During previous summits, members of the domed and immersive communities shared their work, successes, and insights. IMERSA Day at IPS 2020 is a "mini IMERSA" Summit, and will feature a mix of keynote speakers, panel discussions, and dome presentations. IMERSA will showcase its strong commitment to immersive art and science, and introduce ourselves to the larger community. Those attending the IPS Fulldome Festival, LIPS, and the IPS meeting are encouraged to come to IMERSA Day to learn more about the expanded possibilities of immersive art, science, and media.

## Future IMERSA Summits

While the team was in Montreal, we took the opportuni-

ty to explore holding the 2021 Summit in Montreal. This is shaping up to be a great collaboration with our colleagues at SAT as well as the Rio Tinto Alcan theater for several days of "all things immersive." Dates will be announced in 2020, so watch IMERSA.org for more details.

Special thanks to Dan, Michael, and Monica for contributing their "summer vacation notes" for this column. ☆

Michael Daut presenting ideas about memorable storytelling during the IMERSA Day event at the Brno Fulldome Film Festival in the Czech Republic. Courtesy IMERSA/Dan Neafus



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A movie poster for "Expedition Reef" featuring a sea turtle swimming in a blue, textured underwater environment. The title "EXPEDITION Reef" is in large, bold, yellow letters. The poster includes several award logos and the California Academy of Sciences logo.



Jack L. Northrup  
Sci-Tech Instructional Facilitator  
Omaha, Nebraska USA  
jlnorthrup@fbx.com

### Surviving the summer of Apollo

I just survived one of the most intense schedules I have ever had in my career. I visited 20 schools and four libraries in 15 days with my portable planetarium in preparation for the Apollo 11 anniversary. The average age for my audience was about 10 years old, so it was probable that the closest person to them with memories of the original lunar landing was their grandparents.

Because of this, I had to take a little different approach in capturing them into the lesson. They were young enough that if I just showed them information in the form of a documentary it would confuse them and they may think that this is a current event; but to just use storytelling techniques could foster lunar landing hoax thoughts. To reach the needs of the students, I had to find a happy medium. Below is the outline I used to balance the fanciful and factual.

#### A Trip to the Moon in 42 and 7/8 minutes

I opened with my standard “welcome to the planetarium,” then used a fisheye picture of the sky that I took earlier outside the school or library to cover the dome with a familiar place. This familiar place is an important anchor location for the students as they can become too immersed in the environment, especially with younger students who are undiagnosed on the autism spectrum. Before each transition we return to this anchor to also give the students a moment to reflect.

Look into the sky, what are the clouds shaped like? Do you see any animals or people in the clouds outside? (I have 3 students share their findings.)

“Let’s do the same thing with the moon. People have imagined seeing many things on the moon. What do you see?” Transition the sky to a static image of the full moon covering 2/3 of the dome. Give the students about 25 seconds (I used 23.25 to 26.4 to avoid numbers that end with 0 or 5) to look at the moon for any images they see hidden in the surface. (I have another 3 students share their findings.)

You can get a wide variety of answers. I have had a motorcycle and a child playing soccer to a chihuahua eating a hot dog.

Return to the anchor point and talk about how before 1959 and Luna 2, the first human-made object to reach the moon, our imagination and telescopes were pretty much our only tools for analyzing the moon.

To help reinforce the concept that this is happening in the past, I made a short video of a clock spinning backwards and a calendar winding back to 1957 as a segue to a short documentary on the space race. This introduces the documentary as an event in the past without having it be too heavy in my dialog. The program at my first two



Top left: In libraries and schools (right), my portable dome went everywhere. Left: Some of the images that children imagined. All images by author. Moon images public domain; moon illustrations courtesy Apple.

schools did not have the wind back transition and I was having to reteach that this is not a live video from Florida.

After the documentary we return to our anchor image and have enough time remaining to craft and practice questions for the students to ask parents and grandparents on their experiences from the actual launch to the moon.

Examples:

How did you feel when you heard about the Moon landing?

Was the whole family watching television with the landing?

Did you play astronaut and follow the mission as it was happening?

#### Instructional management hints for this activity

If you are telling the students they have a specific amount of time for a step (like finding images on the moon), do not use numbers ending in zero. Saying they have 20 seconds will cause some of the space-minded students to start a countdown instead of doing the activity. Try “23 and 1/3” instead so they will trust that you are keeping track of the time.

Tell the students before a share out exactly how many people will get to share at that point, but remind them there are going to be more opportunities later in the presentation. I have found three to be a good number for the share outs because any fewer, then the student involvement is too low; if you do more, like 6-8, then there is a chance for bird walk conversations. Example of a bird walk conversation “Do you see any pictures of animals on the Moon?” “I have a dog and sometimes the moon is out when we play in the backyard.”

*(Continues on page 52)*

Jack L Northrup is an American Midwestern astronomy educator who loves the dark skies from living in a flyover state.



# THE EDGE

PLUTO AND BEYOND



## COMING SOON

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Jeanne E. Bishop  
Westlake Schools Planetarium  
24525 Hilliard Road  
Westlake, Ohio 44145 USA  
+1 440-871-5293  
jeannebishop@wowway.com

## Make use of “The Value of Education” document; the influence of famous people

I always am saddened to learn of the closure or threatened closure of a planetarium. Twice (years ago) my own planetarium with the Westlake Public Schools was threatened, but we survived. I was glad to have had the support of certain staff members and parents, who, on their own and at my urging, spoke to and wrote letters to the superintendent pleading reconsideration. IPS President Dale Smith also wrote a supporting letter. I made a list of all the ways in which programs at the planetarium were beneficial to our students and our community. I spent some time and effort on the list, first meeting with the superintendent and giving it to him, and then distributing it to members of our board of education. I believe the definitive list helped.

With this experience, I felt confident about preparing the white paper requested by IPS President Mark SubbaRao, “The Value of Education in the Planetarium” (pp. 8-11), which appeared in the June issue of *Planetarian*. You will also find it on the IPS website at [www.ips-planetarium.org/page/planetariumeducationvalue](http://www.ips-planetarium.org/page/planetariumeducationvalue). With the help of others, notably Dayna Thompson and Sharon Shanks, and a huge resource of relevant articles in past issues of *Planetarian* and online research, the project was completed.

Mark made it clear that he wanted the paper to substantiate declarations of the value of the planetarium, and the extensive review of past literature made this possible. A brief IPS statement on this subject was prepared years ago but was not supported by research, and “Educational Value of the Planetarium” documents have been published by some regional planetarium associations. However, these do not address the technical situation of the fulldome planetarium, nor do they reflect planetarium research of the last decades.

It is my hope that currently no planetarium is being considered for closure. However, if the situation exists, please use this full white paper or the one-page summary (or both) or pass on its availability for use to the appropriate persons. For the greatest effect, I recommend being present with the person or group leading the decision to close your planetarium when you give a copy of the written document. Make it clear that you are there to clarify any item that is in the document—and be ready to respond with knowledgeable and enthusiastic answers. Look up some of the many references given with the paper. Note one or more of the quotations given with the paper.

Also, see Sharon Shanks’ excellent article in the June *Planetarian*, which describes the present collection of planetarium research, mostly done in the past decade. Extend what is in the short paper descriptions with how your facility is providing that value.

Best wishes on reversing a decision if your planetarium is threatened with closure. In this event, I hope that our offering of “The Value of Education in the Planetarium” will help you.

### You also can use the document now

Most healthy planetariums also can make good use of the document. Can you present a copy to the CEO (or superintendent of a

school district, or dean or president of a university, chair or president of a museum) of your facility, along with a personalized letter? Would this enhance the already-positive disposition of your boss so that future requests for resources are more likely? When you read the value points made in the paper, do you find that you are doing all that you can to further these values? Is there more that your technical capabilities, creative capabilities, and staff time currently allow? Is there something in the paper that you would love to be able to do but lack the resources (funds, staff, space)? Could you point this out to the CEO, the board, parents or other community members, possibly leading to a special allocation of funds for the project? Could citing one or more of the paper’s value points in a grant proposal accentuate the importance of your project? Can the document be used in helping to train new staff members? At one of your regional or local planetarium professional meetings, would a discussion of the document lead to sharing of the different ways that the value areas are covered at different planetariums and new special projects that can be undertaken by the professional association?

As we near the special centennial anniversary year of the planetarium, for which IPS has a special task force headed by Bjorn Voss, I hope the points of the paper will be helpful to many planetariums worldwide for public relations purposes and in interactions with media.

I welcome your ideas on the document. Please share them with me.

### The benefits of contacts with famous people

With interest I read in the June issue of *Planetarian* how some people have met and always remembered their contacts with well-known individuals.<sup>1</sup> I also have had the honor of meeting and talking with (even arguing with) famous individuals. I am sure that my contacts have resulted in benefit both to myself and to students in classes and programs I have given. And I like to think that sometimes there is a domino effect, in which benefits I derived from contacts and worked to transmit are transferred further by them to others.

I met all three Apollo 11 astronauts, although at different times. Neil Armstrong was a guest on the ship Canberra which sailed to Dakar, Senegal, in the summer of 1973, for a total solar eclipse lasting 5 minutes and 44 seconds on June 30. Youngstown (Ohio) State University planetarian Ted Pedas co-organized this trip, and a number of celebrities were on board to give lectures and mingle with other passengers.

One evening my husband Allan and I joined a group of five people walking on deck. Armstrong was one. I asked Armstrong whether or not he could see stars when he was on the moon, as this had been a question students had asked me. He said no, if he looked toward Earth or even toward the moon’s surface. Only if he lifted his head and looked in a direction away from Earth were bright stars visible. I had my definitive answer to share with students from that time on.

I met Michael Collins when he gave a lecture in Cleveland in June, 1988. I was able to speak with him as he signed his great book *Lift Off* (1988, Grove Press, New York).

About 20 years later I met Buzz Aldrin at a symposium in Phoenix,

Jeanne Bishop is a past president of IPS and chairs the Education Committee. She is retired from full-time planetarium work and teaching, but maintains the position of Westlake Schools Planetarium director.

<sup>1</sup>See “Close encounters of the Sagan kind” by Tom Callen on page 74, June 2019.

where I talked briefly with him when planetary scientist Carolyn Porco asked me to take a picture of her with him.

It was not so much what was said in these contacts with Collins or Aldrin, but my realization after meeting them and Armstrong that I had met and conversed with all three people who were part of the very first human moon mission. When I share this fact with students, if they understand the significance of what these people did, I sometimes get the reaction of “Really?” or “How were you able to do that?” or (mostly) “What were they like?” or “How did you feel?” I get the impression that the way that I am regarded increases a little and people listen to me more carefully.

A few years ago, at a *Sky & Telescope*-sponsored workshop on the Canary Island of Tenerife, I had the enormous pleasure of shaking (or rather, holding, as he could not then move) the hand of world-famous

that did not mean he was correct about this. For about five minutes we debated the issue, but in the end he flatly refused to change his position—he said he was right, he knew best, and that was that!

As much as I admired Carl Sagan for other reasons, in this declaration I was very disappointed. The take-away lesson for me was that not all widely-admired and brilliant people are brilliant about everything.

I talked with science and science-fiction writer Isaac Asimov on three occasions (the first time on the Canberra Eclipse cruise in 1973 that I mention above), but the most interesting time was at a U.S. National Science Teachers Association national conference. Asimov gave an invited talk, but he came early and visited the exhibit area earlier the same day.

While I was in a small side room preparing for a talk, he wandered in. I recognized him and said hello. He sat down and I had an inspiration



The stellar lecture staff aboard the Canberra's African Eclipse Cruise, from left: Dr. Vincent Schaefer, director of The Atmospheric Sciences Research Center of the State University of New York; Mercury 7 Astronaut M. Scott Carpenter, who went on to become an aquanaut with the Navy Seal's Sealab Program; Dr. Franklyn M. Branley, chairman of the American Museum-Hayden Planetarium; Dr. Isaac Asimov, writer of science fact and fiction; Walter Sullivan, science editor for the *New York Times*; and Apollo Astronaut Neil A. Armstrong, first person on the moon and professor of Aerospace Engineering at the University of Cincinnati.

The Canberra African Eclipse Cruise was among the first astronomy-themed cruises organized by Ted Pedas, Marcy Pedas Sigler, and Phil Sigler; it launched the phenomenon of astronomy and other science destination theme cruises. Photo by George Pedas, used with permission.

astrophysicist Stephen Hawking. It was my birthday, and I had met one of Hawking's nurses at breakfast. She brought me to meet him in the cafeteria.

I told him how I helped students learn about his contributions, and that I had retired from full-time teaching, but I still directed our planetarium and gave classes there. He used his computer talking voice to say...“You're just like me...still working.” What an amazing feeling it was for me that he compared himself in one way to me. I enjoy telling students and parents in classes and live family planetarium programs about this encounter after I explain who he was and what he did. As with the astronauts, I think that my image is elevated a little, and people are more interested in what else I have to say.

### Jeanne's own close encounter with Sagan

At the 1976 IPS biennial conference at Fiske Planetarium in Boulder, Colorado, Carl Sagan gave an invited talk. Immediately afterwards, I spoke privately to Sagan about a recent article in *Sky & Telescope* in which he described his visit to an elementary classroom. Sagan claimed that very young children exhibited particular advanced spatial abilities.

At that time I was in the midst of both an extensive literature review and Ph.D. research on children's thinking and spatial development. I was sure that Sagan's claim for adult-like spatial abilities of those in the “regular classroom” he visited was incorrect. I asked him if perhaps the class had a number of gifted children. He said no, the children were just “normal and average.” Although I knew I was speaking to a world-famous writer and publicizer of astronomy, I would not give in to what I thought Sagan wrongly stated.

I started telling him about my own studies, and how my own research results and the work of Jean Piaget contradicted him. He may have been tops in most areas of his widespread communications, but

to ask him about writing a planetarium program. I told him I loved both of his stories “Nightfall” (first published in 1941) and “The Last Question” (first published in 1956), which had been made into planetarium shows. I asked him if he would please write another story, one to be used specifically in planetariums.

Asimov explained to me in definitive detail (he spoke in a careful way in which every word counted) how he could *not* write a planetarium program, since basically the planetarium is a visual, spatial medium. Asimov told me that he was able to think only in words, never spatially or in pictures.

I found this hard to believe, as his written descriptions in books of how planets and moons would be seen from different perspectives are so good. He said that although a reader may be visualizing what he wrote, he worked with only mathematics and words; he never had mental images of anything. This was particularly surprising to me, as Asimov admitted that he had a photographic memory for printed pages.

From this conversation I learned that the human brain can operate in very unusual ways. Isaac Asimov was a wonderful writer and speaker, and I will always appreciate so many of his books and stories. Yet, I feel somewhat sorry for him because he could not have mental pictures.

Sometimes I have students take “mind trips,” that is, guiding their imaginations with descriptions while their eyes are closed. Since that conversation with Asimov, I'm always aware that there may be a student who is unable to “see” in his or her imagination what I am describing—such as traveling close to a black hole or landing on a Martian landscape. There are some individuals who must have the special visual images, offered in different formats in planetariums, that (thankfully) can be provided by artists.

I have had very meaningful contacts with a few important women

*(Continues on next page)*

astronomers. The three that meant the most to me were Vera Rubin, who discovered the dark matter in the outer parts of the Milky Way Galaxy (“a Copernican-style change in cosmological theory,” said the *New York Times*); Eleanor Helin, principal investigator of the NASA Near-Earth Asteroid program; and Janet Mattei, head of the American Association of Variable Star Observers for over 30 years.

I found that it was easy to talk to each of these women, and they were friendly without any hint of ego. Their approachability and willingness to discuss a variety of both astronomical and non-astronomical topics (1) gave me knowledge to pass on to students and those attending public planetarium programs, (2) inspired me to work hard at what I do, in my professional capacity as a teacher and planetarium presenter, and (3) taught me to always be reachable and available to those who have questions and want other discussion.

Vera Rubin was told by her high school physics teacher that she should not pursue a scientific career, but to just get married and have children. Rubin’s determination did not let the physics teacher’s advice deter her. Yes, she married and had four children, all of whom became science and mathematics professionals inspired by their mother, and of whom she was very proud. But that was not all.

Rubin’s heroine was Maria Mitchell, the first woman American astronomer. Rubin encountered sexism throughout her career, which just made her more intent in helping girls pursue astronomy.

Janet Mattei described coming to the U.S. from Turkey, wanting a career in astronomy even though girls of her culture normally were not admitted into scientific careers. Like Rubin, she later went out of her way to be a mentor to all, particularly girls, who wanted to be astronomers.

Eleanor Helin (who had the nickname of “Glo”), while a very busy person with worldwide commitments, always took time in person and on the phone to discuss my planetarium activities and my father’s astronomy work. Once, when I visited her in Pasadena, we went to dinner and spent much of the evening talking about planetariums and how her work might help me.

## The greatest influence: my father

The person with the greatest influence on my life was my father, Richard H. Emmons. When he died in 2005, I wrote a long article for *Planetarian* about his work (March 2006). I think one could say my father was something of a celebrity. As a young teenager he gave talks in the Canton, Ohio, area and became known there as “Mr. Astronomy.” He studied German in high school and wrote Albert Einstein in German, to ask what Einstein thought about the possibility of extra-terrestrial life. Einstein responded (in German) that it was probable that there were many more forms of life than those on Earth. My father said the act of his hero Einstein writing back to him was one of the most important and motivational things in his life.

Emmons established and directed the very first U.S. Moonwatch team, the Akron-Canton team, when the Soviet Union’s first satellite Sputnik went into orbit. During the 1950’s and 1960’s, with a portable observatory on Mount Palomar in California, my father made detailed observations of the U.S. satellite Echo I. He helped design the telescope while working at Goodyear Aerospace Corporation. He met with Werner von Braun to share his results.

My father’s observations demonstrated that Earth’s near-space environment has fewer hazards than previously expected and was therefore safe for human spaceflight. As a consequence of this achievement, in 2000 Eleanor Helin asked Brian Marsden, director of the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics, to name an asteroid for him, “Emmons 5391.”

In September, 2019, Emmons 5391 will be a major telescopic target for amateur astronomers at the Wilderness Center Astronomy club in Wilmot, Ohio, where he was a long-time member and had received a lifetime service award.

Emmons was an early promoter of the small planetarium, and he built one with his Kent State University students for \$100. Later he established a planetarium in a special garage built behind our house, the Star Barn. Over his lifetime, my father established 23 planetariums. He hand-drilled all stars in globes with different sizes of drill bits.

I gave many pre-recorded talks in our Star Barn, released from my high school classes for a few hours at a time. This experience excited me about becoming a planetarium/science teacher. When the Hoover-Price Planetarium with a Spitz A3P projector opened in Canton, I became its first director.

In 2006 my husband Allan and I established the Astronomical Society of the Pacific’s Richard H. Emmons Award for Excellence in College Astronomy Teaching. With this award, I feel that my father’s education, astronomy, and planetarium accomplishments live onward.

I have been very fortunate to have had my father’s guidance and contacts with well-known astronomers. All have shaped my professional life, which has been dedicated to planetarium and astronomy teaching and other science education work.

Sometimes former students come to see me and tell me that I have had an effect on their lives—their selection of a college major or minor subject, astronomy as a hobby, and, in one case, the marriage of students from one of my astronomy classes. I am so glad. One does not know what effect a program, a class, an enthusiastic description, a private friendly discussion, or requested recommendations can have. I hope that all planetarium teachers and communicators keep this in mind. Every planetarian has the potential of providing guidance and being a “great” person for someone. ☆

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## Classdome, continued from page 48)

“Let’s take it to 1” and having a focus cue is useful in break out times. “Let’s take it to 1” is a term that was adopted by 80 of my local elementary schools as a cue to tell students it is time to bring our voices to a whisper and then silence when the speaker is talking. So many schools have adopted it because of the high number of students who will change elementary schools within the area before moving to middle school. Having similar terminology and expectations made the transition easier. It also helps speakers because you don’t have to learn multiple management plans for each school. Focus cues can be repeated if they don’t prompt the desired response, but if you have to do it three times you may want to bring the planetarium lights up just a bit to facilitate seating changes before continuing.

Remember the Age+2 rule for student attention? The Age+2 rule means if you are working with first graders (average age is 6), then you need to be changing the approach to the content every 8 minutes to keep them engaged. You can have a topic last the entire block of the show, but consider how are you splitting up the content so it fits within the 8-minute block.

## So what’s next?

This was an honest question that went through my head this August. After the anniversary I had a couple of conferences and an awesome 6-week course on productive dual language instruction (I am holding off on this article topic until I’m finished with the course), but inspiration really struck when I got a letter from one of the libraries I worked with this summer with the topic of next summer’s reading program. The theme of the 2020 summer reading program is “Imagine Your Story” (<https://www.cslpreads.org/programs/future-programs/>) with a focus on tall tales, folk tales, mythology, and fantasy and the featured artist is LeUyen Pham (<http://gallery.lib.umn.edu/exhibits/show/techniquesandmedia/biographies/leuyen-pham>). It looks like I am going to be brushing up on my storytelling in preparation for next summer and will get a chance to put some of my language arts techniques to good use. ☆

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## Dear fellow planetarians

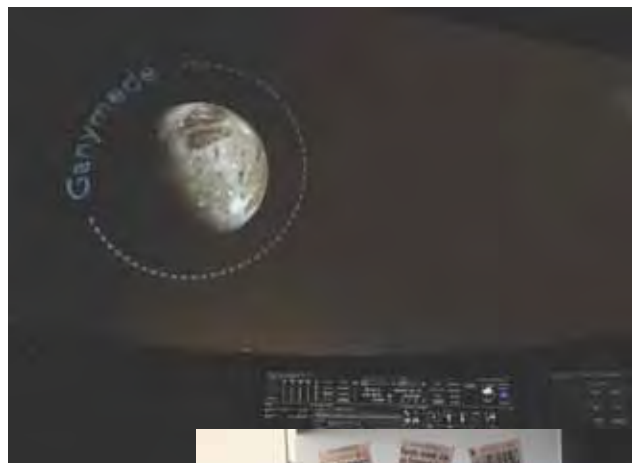
Below you will find evidence of our very active worldwide community in many ways: through new planetarium shows, educational and out-reach activities, design of new venues, web-based resources, and engaging activities that took place in July to celebrate the 50th anniversary of the first human on the moon.

For this section I'm indebted to contributions from Aase R. Jacobsen, Anna Arnadottir, Milène Windling, Loris Ramponi, Alexis Delivorias, Ignacio Castro, John Hare, and Beau Hartweg.

Let's start the tour around the world in Scandinavia.

### Nordic Planetarium Association

**Sweden.** The Lund University Planetarium and the Royal Observatory Greenwich have released a free dual-language show called *Moons Beyond Counting* (Swedish: *Månar och mindre himlakroppar*). This show is (so far) only available to planetariums running Sky-Skan Dark Matter. It is a modular show where different planetaria can contribute with their own 5-7-minute content segment(s). These content segments can be used individually, or they can be bound together to form a full-length show.



The currently available content segments include: "The Apollo Missions," "Moongazing," "Formation and Geography of the Moon," "Icy Moons," "Jovian Moons," "Saturnian Moons," "Eclipses and Phases," and "What Makes a Moon." The Lund University Planetarium will soon add two more content segments: "A Lone Star" and "Water on the Moon."

The show premiered at the Lund University Planetarium in late July 2019 to celebrate that 50 years has passed since people first walked on the surface of the moon. The Lund University Planetarium (anna@astro.luse) and the Royal Observatory Greenwich (EBloomer@rmg.co.uk) invite any and all Dark Matter users to join the collaboration.

**Denmark.** During the summer, the Steno Museum in Aarhus celebrated the 50-year anniversary of the lunar landing by setting up a small exhibit that featured a living room from 1969 that included a television with film and sound of that time. The walls are decorated with several newspaper front pages from the time around the lunar landing, and it was possible for the visitors to write their memories from that day in a guest book.

In the planetarium, there were live presentations about the moon and the lunar missions. It is also possible to take a picture with the 12 moonwalkers while wearing an astronaut suit.

**Finland.** Kakslauttanen Arctic Resort's Planetarium in Finland will open in autumn 2019. It's one of the largest planetaria in Scandinavia, with a dome of 18 meters that will be tilted at 24 degrees. A Digistar 6 system with 4K resolution is installed, together with five Sony VPLGTZ-280 projectors, Spitz seamless dome, and 145 Skeie Sonate Planet seats (142 seats + 3 seats for wheelchairs). For more information, see [www.kakslauttanen.fi](http://www.kakslauttanen.fi).

At Heureka, The Finnish Science Center Planetarium, Sky-Skan

(Continues on page 56)

NPA. Above left: Content segments from *Moons Beyond Counting* in the dome in Lund. Courtesy of Anna Arnadottir. Below, the exhibition at the Steno Museum celebrating the lunar landing, and some of the children who had their photo taken with the moonwalkers. Courtesy of Erik Balle and Aase R. Jacobsen, the Steno Museum.





Bringing Snøhetta's design to life is the visualization team Plomp, based in Amsterdam. As an indication of Plomp's attention to details, you'll see a Zeiss projector through the planetarium's door; "We thought it looked cooler than those digital projects," the company said. ©Snøhetta/Plomp-mozes; used with permission.

## A planetarium nestled in a Norwegian forest

The architectural firm responsible for the award-winning Bibliotheca Alexandrina and the Norwegian National Opera and Ballet has received plan approval from Norwegian authorities for a new planetarium and visitor's center for Solobservatoriet, Norway's largest astronomical facility.

Snøhetta has designed the facility to be nestled in the dense forest of Harestua, located 45 kilometers north of Oslo in the municipality of Lunner. Solobservatoriet is the largest solar observatory north of the Alps, and with its top-notch equipment and elevated site 580 meters above sea level, the expanded facilities will offer guests the opportunity to discover one of Northern Europe's foremost astronomical research stations.

Norwegian authorities gave its final approval for the plans at Harestua in May 2019. This approval is a significant milestone for the project and the documentation the team at Harestua needs to secure finances.

Snøhetta's design comprises a brand new, 1,500 m<sup>2</sup> planetarium as well as scattered interstellar cabins, each shaped like a small planet. The new facilities will offer a range of scientific activities within astronomy, sun studies, and natural science. Here, researchers, school children, retirees, and international tourists can embark on a journey into the world of astronomy and learn more about natural phenomena, such as the northern lights and the night sky.

The new visitor's center is situated near the original solar observatory, a 12-m research tower built by the University of Oslo for the total solar eclipse of 1954. More than a decade later, in the late 50's, Solobservatoriet expanded its facilities through a collaboration with the US Air Force with the introduction of a satellite tracking station that monitored Soviet satellites during the Cold War. From 1986, and until it was sold in 2008, Solobservatoriet served exclusively as a scientific research and information hub administrated by the university.

Today, the visitor's center is owned by the Tycho Brahe Institute, named after the 16th century Danish scientist and founder of modern observational astronomy.

### The planetarium

The planetarium is the first object that will catch the eye when arriving at the facility by foot by trails through the woodland with its grazing sheep. It is a celestial theatre that represents over two

millennia of astronomical advance and scientific progress. The roof will be lushly planted with grass, wild heather, blueberry, and lingonberry bushes. Wrapping around the golden cupola, the living roof will function as a cross between landscape and built structure that visitors can stroll on to gaze up at the starry sky. Half-sunken into the ground, the three-story theater will emerge from the earth as an orb engraved with constellations, gradually revealing itself as people approach.

At the planetarium's heart, the dome-shaped celestial theatre will educate visitors about astronomy and the night sky in a 100-seat theatre allows for a realistic projection of stars, planets and celestial objects. The theater will be surrounded by a reception, café, and exhibition area and a gently swirling ramp leading up to an exhibition mezzanine and the outdoor roofscape.

### The planets

Surrounding the planetarium will be seven orbiting "planets," or interstellar cabins, each with its own unique design. The planets' surfaces will be clad with rough or smooth materials. While some will appear to be halfway driven into the ground, others will be gently resting on the soft forest floor, as if they just landed.

Rather than small-scale models of real-life planets, the cabins will be imaginary objects, each with a specifically-assigned name. Six of the planets alternate between 8 and 10 meters in diameter and can accommodate up to 10 and 32 people. The smallest planet, Zolo, is 6m in diameter and is composed of a two-bed cabin, allowing for an undisturbed night under the stars.

### About the company:

Snøhetta, headquartered in Oslo with offices in New York, has designed some of the world's most notable public and cultural projects over the past 30 years. Snøhetta kick-started its career in 1989 with the competition-winning entry for the new library of Alexandria, Egypt. This was later followed by the commission for the Norwegian National Opera in Oslo, and the National September 11 Memorial Museum Pavilion at the World Trade Center in New York City, among many others. Recently-completed works include Calgary's new Central Library in Canada, the Lascaux IV Caves Museum in Montignac, France, the expansion to the San Francisco Museum of Modern Art, and the design for Norway's new banknotes.

To learn more, go to [snohetta.com](http://snohetta.com). Source: Snøhetta Press Kit





APLF. Participants of the annual meeting at the Museum of Air and Space at Le Bourget. Courtesy of Daniel Audéon.

made an upgrade to the Sony 4K projectors last spring and in November they will change all the computers as part of a major upgrade. For more information, see [ww.heureka.fi/planetarium](http://ww.heureka.fi/planetarium).

## Society of French Speaking Planetariums

The French-speaking planetariums celebrated the first steps on the moon during the month of July. As examples:

- The Centre d'Astronomie de Saint-Michel l'Observatoire organized a public event for the 50th anniversary of Apollo 11 with astronaut Patrick Baudry, as well as an exhibition on the moon.
- The Office de Tourisme de Laval Agglomération organized its first edition of Le Marché des producteurs et artisans locaux au Clair de Lune during the 2019 summer season. For the 50th anniversary of humanity's first steps on the moon, the popular observatory offered to the public the opportunity to observe the moon, its craters, and the planet Jupiter through the telescopes.
- The planetarium of Strasbourg presented three sessions in the planetarium to tell the story of this historical mission with the presentation of a great lunar meteorite.
- The Planetarium of Nantes offered various activities to celebrate the 50th anniversary of Apollo 11. A special live Apollo 11 session, four times a week for the whole summer, was created in cooperation with the Planetarium of La Cité des Sciences et de l'Industrie (Paris). Thanks to the SkyExplorer software, they traced this epic time. In cooperation with the Museum of Natural History of Nantes and the Society of Astronomy of Nantes, on 12 July the Sciences Noctambules, an evening open to all free, took place. It was dedicated to the observation of the moon live in a public square.

The 2019 APLF conference took place in May at the Museum of Air and Space in Le Bourget, near Paris: there were some 60 participants, three days of exchanges and round table meetings, vendor demonstrations, visits to the Museum-altogether, a wonderful success!

## Italian Association of Planetaria

Kevin Milani (Hibbing Community College, Minnesota, USA), the 2018 winner of the Two Weeks in Italy competition, together with Loris Ramponi (Serafino Zani Astronomical Observatory), present a new Face-

book page named "Not only stars" that collects images and slides discussed through Whatsapp. Is a project open to other planetarians and teachers interested in joining in the collaboration. Find it on Facebook at <https://www.facebook.com/groups/320288065516758/>.

The title of the page reminds us that the images are not only of astronomical interest. Any kind of subject can be included. The main topic is the connection between different sites, in particular Italy (or other countries) and the United States. Often the starting point are images published by newspapers.

The promoters of this page suggest using the images as slides for public and school projections. They are peculiar, interesting, and full of curiosities. During a public projection they can attract the attention of the audience and can be used in a game of "What is this image?" For students who learn foreign languages, short audio descriptions are available (as mp3 files) in English, French, and Italian.

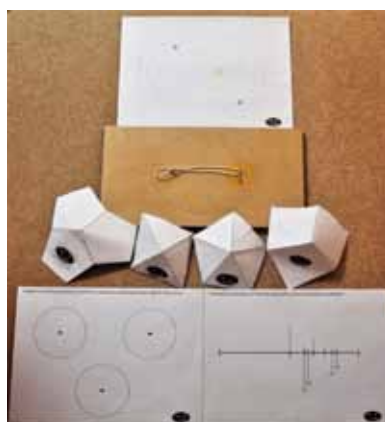
The page will be updated with new images weekly and the complete list can be requested of the administrators. One example of the images to be published was taken inside the Grand Theater of Brescia showing a strange "telescope" in one of the balconies. In fact, it is a large spotlight that lights the actors during the show. The slide combines the photo with the advertising of a reflector telescope from the 1970s.

Another image featured on the "Not only stars page" is devoted to the beautiful foyer at the same theater. The ceiling represents a large fresco of the XVIII century where it is possible to recognize an armillary sphere. The image is combined in a slide with a painting and a monument, both with the same historical astronomical instrument.

The starting point of the last example is an article devoted to a long trip of many months that involves an Italian family (parents and their two young girls) travelling on bikes in South America. A slide combines the title of the article, the photo of the bikers, and the image of the Milky Way reflected on the water of the Titicaca Lake.

On 26 October, Italian planetariums will be involved in the organization, at local level, of the National Day about light pollution. Also, the transit of Mercury (11 November) will be an important astronomical event of the 2019 calendar.

Two years ago, the StarLight... a Handy Planetarium Association produced an original project titled The Relationship Between Music and Science, a Pathway to Discovering Number, Sound and Wavelength Reciprocity. The project is aimed at creating musical compositions devoted to each planet of



IAP. Top: Example from the Not only stars Facebook page depicting a visit by an Italian family to the Titicaca Lake. The site is so dark that the faint light of our galaxy can be seen on the surface of the water! The article is taken from *Giornale di Brescia* (6 December 2019, page 15). Left: The worksheets used by students during the workshop on Kepler's research. Courtesy of Simonetta Ercoli.

our solar system which were inspired by Johannes Kepler's *Harmonices Mundi* treatise.

Kepler formulated the three laws of planetary movements derived from Pythagorean ideas on the music of the spheres, and then transferred this concept to the rules governing planetary motion.

This year the association transformed Kepler's research into a workshop for middle and secondary school students. All the work was organized using a PowerPoint presentation as a guide to activities, which were divided into five steps with specific work-sheets for each one. As Kepler used geometry to build his model of our solar system, we did the same and guided students to discover that theory, however perfect, must match evidence.

In the first worksheet students had to calculate the main musical intervals (eighth, fifth, and fourth) along a string. In the second they had to fix the same values along a circle, using the inscription and circumscription of regular polygons. In the third step they then built paper models of the five regular solid angles so as to understand the polyhedral geometrical model of Kepler's solar system.

In all of these hypothetical models the distances of the planets from the sun matched the ratio of the musical intervals, but the geometrical structure did not match the data recorded by Tycho Brahe in his observations. In this way, the concept of ellipse was introduced and students constructed one in the geometrical manner and then found the three laws derived from it. In the end, it was shown how Kepler succeeded in establishing the harmonic intervals on this kind of model, too, thus creating his pentagram of our solar system as known at that time.

## European/Mediterranean Planetarium Association

**Greece.** On Saturday 18 May, the New Digital Planetarium of the Eugenides Foundation in Athens participated in the Night of Museums cultural event with free screenings of *Life in the Universe*, a show highlighting the fascinating search for life beyond Earth. The show was introduced to the audience by Dr. Manos Kitsonas, director of the Eugenides Planetarium, and Panos Sakas, a physicist and journalist. The event concluded with an observation of the night sky with the telescopes of the Hellenic Amateur Astronomy Society.

On the occasion of the summer solstice, and as a prelude to the festive activities celebrating the 50th anniversary of the Apollo 11 mission, the New Digital Planetarium screened *From the Earth to the Moon*, highlighting the intense race between the Americans and the Russians to first set foot on the moon. The show was introduced to the audience by Director Kitsonas and Tina Nantsou, a physicist, blogger, and dissemination partner of the Physics Department of the National and Kapodistrian University of Athens. Just before the show, Tina Nantsou conducted for her audience simple experiments, related to the physics of rockets, free fall, etc.

The 50th anniversary of the legendary Apollo 11 mission that ferried the first astronauts to the moon was celebrated on 20 July with a fascinating panel discussion that included some of the most prominent Greek scientists. It was a great success with more people turning up than could be accommodated at the planetarium and the conference center.

During the main event, Dennis Simopoulos, emeritus director of the Eugenides Planetarium and the only Greek correspondent who reported onsite at the launch of Apollo 11 from Cape Canaveral, moderated a panel discussion of distinguished guests that included Stamatois Krimigis, Thanasis Economou, Anezina Solomonidou, and Nikolaos Paschalidis.

Krimigis is the legendary Greek-American scientist who has made key contributions to many of NASA's robotic space exploration programs and has served as principal investigator or co-investigator on numerous NASA missions, including the Cassini Orbiter and Voyager 1 and 2. A member of the Academy of Athens, he designed, built, flew, and analyzed data from 21 instruments on NASA/ESA space missions, and has designed and built instruments that have flown to all nine classical planets (the only scientist to have done so).

Economou, an astrophysics professor at the University of Chicago and scientific researcher at NASA, has been building robotics and measurement instruments for interplanetary spacecraft since the mid-1960s, being associated with some of NASA's major space missions, including the Mars Exploration rovers, Cassini, Rosetta, Stardust, and Stardust-Next.



EMPA. At dawn, just before the launch of Apollo 11, a very young Dennis Simopoulos stands in front of the Saturn V rocket that sent the first astronauts to the moon. Courtesy of Dennis Simopoulos. Below: Storytelling for the youngest: children discover the fantastic world of Zoran Krušvar. Courtesy of Rijeka sport Ltd.

Solomonidou is a planetary geologist, specializing in the volcanology of the icy moons of the outer solar system. As a postdoctoral fellow at JPL, she collaborated with NASA and today she works at the European Space Agency for the implementation of the JUICE mission for the exploration of Jupiter's icy moons.

Paschalidis is senior project scientist for technology advancement at NASA's Goddard Space Flight Center's Heliophysics Science Division (HSD). He is the chief of technology for the HSD and assistant chief of technology for NASA/GSFC.

The panel discussion was followed by the screening of the digital show *From Earth to the Moon*, a Eugenides Planetarium production, focusing on the USA-USSR race to conquer the moon. The event included other goodies, such as a model of the lunar module Eagle, observation of the starry night with the telescopes of the Hellenic Amateur Astronomy Society, and the hands-on exhibition *Planets in Your Hands*.

The team behind the *Planets in Your Hands* project is a public outreach group from the Physics Department of the National and Kapodistrian University of Athens, which won one of the two funding awards of the Europlanet Funding Scheme 2017 competition. The project consists of an exhibition of eight planetary surfaces, 4 gaseous

*(Continues on next page)*



The combined MAPS-SEPA conference at the BlueCross BlueShield Planetarium of the South Carolina State Museum in Columbia, South Carolina. Courtesy SEPA.

and 4 terrestrial, giving a visual and tangible representation of a wide range of environments in our solar system.

**Croatia.** In April, The Rijeka Astronomical Centre celebrated its 10th anniversary and participated in different national and international events. On the occasion of the Dark Sky Week (2-6 April), it screened *Losing the Dark*, a short planetarium show explaining how light pollution disrupts our view of the cosmos. On the same week, there was also a storytelling session by Rijeka writer Zoran Krušvar, who narrated the story of his upcoming picture book for children.

The Rijeka Astronomical Centre once again participated in the annual Science Festival. This year's main theme was colors and the program at the digital planetarium included *The Little Star That Could*, an animated film for children, as well as *Touching the Edge of the Universe*, for the adult audience.

Earth Day was also celebrated on 23 April with the Encounter with Astronomy show, aimed for the higher grades of elementary school, focusing on constellations, orientation by the stars, etc. After the show, Vitomir Maričić, world record holder in free dive, sport climbing instructor and explorer, shared his experiences from numerous expeditions all over the world regarding the protection of endangered species. During the lecture, the audience marveled at his photos and videos of distant the places and the unique plants and animals he encountered during his expeditions.

On 15 May, on the occasion of International Day of Families, the digital planetarium screened *Kaluoka'hina-The Enchanted Reef*, while the day after, on the occasion of UNESCO's International Day of Light, it once again screened *Losing the Dark*. On 18 May, on the occasion of the blue moon and of the 18th anniversary of the Rijeka observatory, the program included the shows *Race to Earth* and *Back to the Moon For Good*, as well as stargazing through the telescope.

In June, the Rijeka Astronomical Centre Rijeka celebrated World Oceans Day with a special lecture and workshop for children, focusing on sea turtles, while during the Festival of the Sea/Fiumare there were different shows and films, as well as workshops on navigation, astronautics and stargazing. Also in June, the celebration for St. Vitus lasted for three days and included presentations about telescopes before stargazing at the observatory.

Finally, during the summer months, the center catered for tourists visiting Rijeka with the show *SEEING! A Photon's Journey Across Space, Time and Mind*, screened in English.

## Association of Mexican Planetariums

A planetarium dome can be used to project and diffuse diverse science and technology themes, especially those that are relevant to

the immediate community they serve. Such is the case of the Planetarium Cozumel, located on the beautiful Mexican Caribbean island of Cozumel, Quintana Roo, which fostered a marine species festival, May-June, named Beyond Sharks and Rays in collaboration with the Saving our Sharks project.

A civil association, mostly formed by the scuba diving community of Playa del Carmen, has been disseminating education through a series of lectures and providing workshops for kids in agreement with the conservation ideals of scientific research, environmental education, and science diffusion.

On other aspects regarding the Quintana Roo Planetarium Net, Mark SubbaRao, IPS president, shared that Karla Peregrina, Cancun Planetarium director who chairs the IPS Equity, Diversity, and Inclusion Working Group will participate in collaboration with IPS President Elect Kaoru Kimura, in the IAU's Astronomy for Equity, Diversity and Inclusion-a road map for action symposia, to take place in Tokyo this fall. (*Note: the Equity, Diversity, and Inclusion Working Group is now the EDI Committee, a standing committee for IPS. - ed.*)

## Southeastern Planetarium Association

SEPA and MAPS, the Middle Atlantic Planetarium Society, held a joint conference at the BlueCross BlueShield Planetarium of the South Carolina State Museum in Columbia, South Carolina. Planetarium Director Liz Klimek, along with her husband Jack Dunn, brought years of experience to bear in staging the largest planetarium conference in South Carolina history. The banquet speaker, Clayton C. Anderson, a retired NASA astronaut, enthralled the audience with details of his 30-year career with NASA and as an astronaut.

The 2020 SEPA conference will be held in Florida. Jon Bell, director of the Hallstrom Planetarium at Indian River State College in Fort Pierce, is pleased to host the conference on 2-6 June. The planetarium features a 40-foot, 12-degree tilted dome, 74 seats, and is equipped with both opto-mechanical and full-dome digital projection. Details will be furnished in the next issue of *Planetarian*.

SEPA will return to Kingsport, Tennessee in 2021 for its 50th anniversary conference. The facilities at Bays Mountain Park include a recently-renovated planetarium situated in a 3,550-acre nature preserve. Planetarium Director Adam Thanz emphasizes that this is the third SEPA conference to be held at Bays Mountain.

For 2022, your facilities' name could appear in this space. Sites interested in hosting the 2022 SEPA conference should prepare an invitation to be submitted to SEPA at the 2020 conference. Tentative plans for 2023 include a US national conference to be hosted by the Sudekum Planetarium in Nashville, Tennessee. Further information, as

it becomes available, will be posted on the SEPA Website.

For any and all information regarding SEPA, please visit the website [sepadomes.org](http://sepadomes.org) and/or contact our IPS representative John Hare at [johnhare@earthlink.net](mailto:johnhare@earthlink.net).

### Southwestern Associations of Planetarium

SWAP held its most recent meeting on 5 April 2019 at the brand-new Winn Science Center and Planetarium located on the campus of St. Marks School in Dallas, Texas. Steve Balog got to show off his new Spitz SciDome IQ4K planetarium, which impressed all in attendance. New officers were elected at this meeting. The are: Sarah Twidal, president-elect; Leslie Barnhill, secretary-treasurer; Cheyanne Suffka, webmaster/social media coordinator; and Beau Hartweg, editor of print publications.

At Noble Planetarium, Fort Worth, The Launchpad: Apollo 11 Promises Kept exhibit presents the past and present of space exploration. It features dozens of artifacts that chronicle the journey of each Apollo mission and what we're doing today. A special highlight is the art and personal effects of Fort Worth native Alan Bean, who landed on the moon as part of Apollo 12 and commanded Skylab 3.

Other areas feature hands-on activities that enable guests to experience how astronomers use light to study the universe. They can also watch Curiosity "explore" Mars in augmented reality and create their very own mission patches. Launchpad is the first entry in a series of internally-developed exhibits that will bring visitors face-to-face with what's new in the world of discovery.

In addition to this amazing new exhibit, the museum has had a temporary mini exhibit in the Planetarium lobby since April leading



SWAP. Participants at the 2019 meeting in Winn Science Center. Courtesy of Beau Hartweg.

up to the summer anniversary celebration. Called Apollo Redux, the exhibit is from the Cosmosphere Space Museum in Kansas. The Noble Planetarium and Omni Imax dome celebrated this momentous anniversary with Imagine the Moon from the Adler Planetarium in the dome, and Apollo 11 in the Omni.

At the Pogue Planetarium, Grand Prairie, fun activities were carried out in June and July. Space Camp filled the week of 15-19 July, where students built and launched their own model rockets while learning about gravity, craters, eclipses, and the Apollo missions, and through it all they created their model for a Mars colony.

*(Continues on next page)*

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SWAP. Donna Pierce, director of HPISD Pierce Planetarium, with Craig Nance, superintendent of McDonald Observatory, speaking to her students about the newest equipment on the HET enabling study of the dark matter, a topic these students are interested in. Below: With a few of her Highland Park Astronomy Club members at McDonald Observatory in January. Both photos courtesy of Donna Pierce. Below, right: The Launchpad: Apollo 11 Promises Kept exhibit at the Noble Planetarium.



During the same week they hosted guests from the Grand Prairie Libraries one night and campers from the lake another night to celebrate the 50th anniversary of the first footprints on the moon.

The Cook Education Center planetarium at Navarro College in Corsicana was busy hosting daily public shows and camp groups all summer long. Since it is still a classic theater, they are presenting some old favorites from the planetarium library such as *More Than Meets the Eye*, *The Cowboy Astronomer*, and *Hubble Vision*. Programs for the public are offered at 2 p.m. Monday through Friday at a cost of only \$2 per person.

At the Center for Earth & Space Science Education at Tyler Junior College, they had a fun and eventful summer. They premiered their new summer show *Secret Ocean*, and are continuing to expand their live show offerings. They have also partnered with area libraries for their summer reading program *A Universe of Stories*. Throughout the summer, they were visiting five different libraries to bring activities and stories related to the moon and the Apollo 11 mission.

The staff also worked with eight other STEM institutions to celebrate the 50th anniversary of Apollo 11 by hosting Moon Day at the planetarium. This event included hands-on activities, model rocket building, planetarium shows, and more.

Since early 1980's Donna Pierce from Pierce Planetarium at Highland Park (Dallas) has been taking Highland Park high school astronomy club members to McDonald Observatory. This trip is always the highlight of the school year.

The University of Texas Arlington Planetarium celebrated the 50th anniversary of the Apollo 11 moon landing with an all-day event hosted inside and outside the planetarium. They had regular public shows as well as free shows covering the Apollo missions leading up to and including Apollo 11, Apollo Trivia, and more. Additionally, Dr. Dora Musielak, UTA adjunct professor of mechanical and aerospace engineering appeared as guest speaker. She gave a talk about the future of human spaceflight. She has a distinguished career in the aerospace industry and is a NASA fellow, AIAA Associate Fellow, and many other recognitions.

Along with the inside planetarium events, the staff was doing engineering crafts, rocket launches, and even some telescope time! You can find more online at: [www.uta.edu/planetarium](http://www.uta.edu/planetarium). For the most up-to-date info on the events, please check out on social media: @utaplanetarium.

On 8-9 June, two SWAP officers, Sarah Twidal and Beau Hartweg, attended the 2023/2024 eclipse planning workshop hosted by the American Astronomical Society in St. Louis, Missouri. This was a great event, and a lot of good planning information was shared. Because of the awareness generated during the 2017 eclipse, many more people will be looking forward to visiting a location in the zone of totality for 2024.

This eclipse will be a big opportunity for SWAP planetariums in particular to share information with their visitors, as the US climate forecasts for April favor clearer skies for many locations in the SWAP region, including Texas, Oklahoma, and Arkansas. Be on the lookout for more information as we get closer to 2024. ☆

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Lars Petersen, PhD, is an astrophysicist and science communicator. From 1997-2016 he was director of Orion Planetarium, Denmark. At present he is engaged in various astronomy communication projects. He is a fellow of IPS.

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Mark SubbaRao  
Adler Planetarium  
1300 South Lake Shore Drive  
Chicago, Illinois 60091 USA  
msubbarao@adlerplanetarium.org

## Astrographics: Interactive data-driven journeys through space

From June 23-26, 2019 a group of computer scientists, astronomers, and planetarians descended upon a castle in Germany for a Schloss Dagstuhl seminar. These seminars bring together people to work on a particular problem in computer science and informatics. The environment is designed to promote collaboration and communication, attendees stay together and eat together.

Organized by Alyssa Goodman, Charles D. Hansen, Daniel Weiskopf, and Anders Ynnerman, the goal of the seminar was to “to bring together researchers from computer science with content producers, learning and communication experts, astronomers and astrophysicists, with the mission to shape the emerging field of interactive visualization in space exploration and astronomy.”

### Closing the divide

The motivation for the seminar stated that: “Until now there has been a clear division between visualization enabling scientific discovery (exploratory visualization) and visual representations used to explain and communicate science to a general audience (explanatory visualization). The seminar is based on the on-going, rapid, convergence, and cross fertilization of exploratory and explanatory interactive data visualization, which is opening new opportunities in visualization research and its applications. The same methodology and data used for scientific discovery can now be used in learning and communication and lead to new levels of user engagement, and at the same time the next generation of exploration tools will benefit immensely from the introduction of concepts from explanatory visualization.”



The seminar attendees.

The seminar was organized in the form of an “unconference” with sessions such as: software integration, augmented reality, domesting, and “OpenSpace.” There was even a session called “Virtual Carter.” Specifically, could we build a virtual avatar/assistant to guide us through a dataset the way that Carter Emmart<sup>1</sup> does.

One of the breakout sessions started the development of a white

paper for the Astro2020 Decadal Survey in the United States, making the case that planetariums can and should play an important role in advancing astronomical research in the future.

The US Decadal Survey on Astronomy and Astrophysics (Astro2020) is a partnership between the National Academies and the astronomical community to identify key priorities in astronomy and astrophysics and develop a comprehensive strategy for agency investments in the upcoming decade. One of the key advances that emerged during the seminar was the ability for different pieces of software to work together. This concept of “interoperability” plays an important role in the white paper.

The abstract of the white paper follows; you can read the full paper-linked from the White Papers’ section of the IPS’s website at [www.ips-planetarium.org/page/whitepapers](http://www.ips-planetarium.org/page/whitepapers).

### IDEAS: Immersive Dome Experiences for Accelerating Science

Faherty, Jacqueline K.; SubbaRao, Mark; Wyatt, Ryan; Ynnerman, Anders; deGrasse Tyson, Neil; Geller, Aaron; Weber, Maria; Rosenfield, Philip; Steffen, Wolfgang; Stoeckle, Gabriel; Weiskopf, Daniel; Magnor, Marcus; Williams, Peter K. G.; Abbott, Brian; Marchetti, Lucia; Jarrett, Thomas; Fay, Jonathan; Peek, Joshua; Graur, Or; Durrell, Patrick Homeier, Derek; Preston, Heather; Müller, Thomas; Vos, Johanna M; Brown, David; Giorla Godfrey, Paige; Rice, Emily; Bardalez Gagliuffi, Daniella; Bock, Alexander

**Abstract:** Astrophysics lies at the crossroads of big datasets (such as the Large Synoptic Survey Telescope and Gaia), open source software to visualize and interpret high dimensional datasets (such as Glue, WorldWide Telescope, and OpenSpace), and uniquely skilled software engineers who bridge data science and research fields. At the same time, more than 4,000 planetariums across the globe immerse millions of visitors in scientific data. We have identified the potential for critical synergy across data, software, hardware, locations, and content that — if prioritized over the next decade — will drive discovery in astronomical research. Planetariums can and should be used for the advancement of scientific research. Current facilities such as the Hayden Planetarium in New York City, Adler Planetarium in Chicago, Morrison Planetarium in San Francisco, the Iziko Planetarium and Digital Dome Research Consortium in Cape Town, and Visualization Center C in Norrköping are already developing software which ingests catalogs of astronomical and multi-disciplinary data critical for exploration research primarily for the purpose of creating scientific storylines for the general public. We propose a transformative model whereby scientists become the audience and explorers in planetariums, utilizing software for their own investigative purposes. In this manner, research benefits from the authentic and unique experience of data immersion contained in an environment bathed in context and equipped for collaboration. Consequently, in this white paper we argue that over the next decade the research astronomy community should partner with planetariums to create visualization-based research opportunities for the field. Realizing this vision will require new investments in software and human capital. ☆

<sup>1</sup> Carter Emmart is the director of astrovisualization at the American Museum of Natural History in New York. Carter’s tours of the universe are iconic, and have set the standard for a generation of planetarians.

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HaritinaM@experiencewellington.org.nz

## There's nothing like sharing the same space

Travelling and meeting people in person do wonderful things for perspectives and connections. It doesn't matter how many times I've seen the news on TV or how many Skype meetings I have had, there's nothing like sharing a cup of coffee with my team while in the same space (no pun intended).

True to that, in June I went from Wellington, New Zealand to Vienna, Austria to attend the 62nd Session of the Committee on the Peaceful Uses of Outer Space (COPUOS). My team here is the not-for-profit World Space Week Association. It is kind of hard to have coffee with these people in person very often.

The United Nations headquarters in Vienna<sup>1</sup> was buzzing as usual with folks from all over the world, very much like an afternoon in a bus in Wellington, exactly as Negar Partow, our International Security lecturer who used to describe it to those of us who have never been to the United Nations.

It has tough security at the gates, many flags in the courtyard, and spectacular hallways full of works of art from all over the world. I gravitated towards the space ones, obviously. I found many treasures, such as a moon rock collected by James Irwin during Apollo 15 and the signatures of Valentina Tereshkova and Yuri Gagarin the first woman and first man in space, who also visited this place in 1963.

COPUOS was set up in 1959 "to govern the exploration and the use of space for the benefit of all humanity" (from the UN website). Nations gather here to discuss pressing space issues and raise things that they are concerned about.

### Litter in geostationary orbit

One of those issues right now is the fact that not only are the oceans being littered, but the sky is as well—with space debris. The geostationary orbit is filling up too. Weather, communications, and surveillance applications benefit from this orbit. We have about 400 satellites out there, but there is a finite number of satellites that can fit at 36,000 km altitude. The number stops at about 1,800.

How these space issues are going to pan out in the next few years remains to be seen as it is up to the politicians to make things happen



Top: World Space Week Executive Director Maruška Strah and the author, senior space communicator and national coordinator of New Zealand, with the moon rock on display at the United Nations in Vienna. Below, Strah giving a statement for COPUOS at United Nations Office in Vienna. Photos by author.

at a state level. But it is up to us, space science communicators, to educate the public about these issues, especially if we have a planetarium handy. I bet we could make a difference by keeping people informed about real concerns around their planet.

At the United Nations, everyone was buzzing about the 50th Anniversary of the first moon landing.

### The genesis of World Space Week

The first moon landing is also responsible for World Space Week, yet another global movement. It started small, in 1978, when the Office of the Governor and the Mayor's Office in Houston announced that the week of July 17 would be known as the Space Week and celebrated with due diligence.

The event must have been successful, as two years later, in 1980, Governor W.P. Clements signed an official Memorandum designating 16-24 of July as Space Week in Texas (NASA Roundup, 11 July 1980). Space Week was aimed to reinforce in the hearts and minds of people that the purpose of the U.S. Space Program is the peaceful exploration of space for the benefit of all mankind.<sup>2</sup>

The celebration in Houston was also meant to recognize the benefits that the space programme was bringing to the nation "through its activities applicable in medicine, agriculture, aeronautics, astronautics, construction, public safety, consumer products, transportation, computers,

communications, urban planning, and solar energy."<sup>3</sup>

We call these today space spin-offs and they are one of the reasons why peaceful space exploration continued to develop outside of events such as the cold war. People found these space spinoffs useful and they wanted more.

Ernie Hillje, Troy Welch, David Koch, and Dennis Stone coordinated the celebrations and a year later formed the "Spaceweek National Headquarters" for a nationwide reach in the United States. By 1999 Space Week had spread to more than 15 nations. It was in that year that the UN General Assembly declared "World Space Week" was to be held every year from 4 to 10 October. The organization offered to the UN to serve as global coordinator of World Space Week, and helped organize the first such celebration in 2000. Dennis Stone remained the WSWA President since its inception.

<sup>2</sup> The same goals are reflected in the United Nations' Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, otherwise known as the Outer Space Treaty, which entered into force in October 1967.

<sup>3</sup> Ibid

<sup>1</sup> Vienna is one of the four headquarters of the United Nations, along with New York, Geneva and Nairobi.

What started at the Johnson Space Center as the 11th anniversary of the first Moon landing today is an international observance of science and technology and their contribution to the betterment of the human condition - the largest celebration in the world.

I watched Michael Collins on the 50th Anniversary of the moon landing in the Google Doodle. He noted at the end: "We were invited to take a tour around the world and I was amazed that everywhere we went people would say: 'We. We did it.' We, you and me, the inhabitants of this wonderful Earth."



It was probably for the same reason that the United Nations suggested in 1999<sup>4</sup> that the dates of 4 and 10 of October should be the new dates of the Space Week: on October 4, 1957 we

launched the first human-made Earth satellite, Sputnik 1, thus opening the way for space exploration; and on October 10, 1967 we signed the Treaty on Principles Governing the Activities of States in the Exploration and Peaceful Uses of Outer Space, including the Moon and Other Celestial Bodies. So World Space Week, too, has an anniversary. This year it is going to be 20 years old!

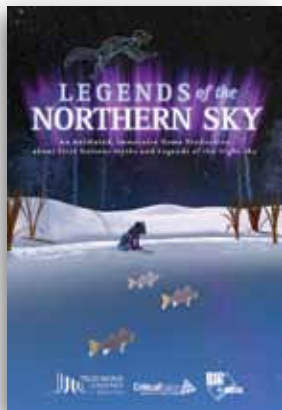
4 Vienna Declaration on Space and Human Development, UNISPACE III meeting, 1999: "Decide, in order to contribute to the achievement of the objectives of UNISPACE III, in particular that of increasing awareness among decision makers and civil society of the benefits of the peaceful uses of space science and technology for sustainable development, to invite the General Assembly to declare, according to its procedures, "World Space Week" between 4 and 10 October for the yearly celebration at the international level of the contribution that space science and technology can make to the betterment of the human condition."

The celebration of World Space Week is under the guidance of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and the UN Office for Outer Space Affairs (UNOOSA) based in Vienna, Austria. For stats, in 2018 there have been more than 5,000 events in over 80 countries, celebrating with the theme "Space Unites the World." To participate is simple: put on a space event during the world space week and then record it online at [www.worldspaceweek.org](http://www.worldspaceweek.org). The theme for 2019 is "The Moon: Gateway to the Stars."

So why wouldn't you be part of something special this year too? Share a cup of coffee with people from your space community, let them know that the United Nations is worried about space debris and too many satellites.

But most of all, no matter where they are, 41 South, Antarctica, the Southern or the Northern Hemisphere, or even on the ISS, let them know that every year they can take a moment and come together with other people around the world during World Space Week to talk about their achievements in space exploration. Many years ago, the people who were present during the moon landing did it and started the movement. And remember to let us know what you're up to as well so that we can spread the word and help you reach many more. ☆

Haritina Mogoşanu is an astrobiologist. Director of the New Zealand Astrobiology Network, director of Milky-Way Kiwi, and senior science communicator at Museums Wellington, she is actively involved in creating networks that engage space scientists with communities through hands-on programmes. Haritina came to New Zealand from Romania for the night sky and has been working at Space Place-Carter Observatory since 2005, presenting and promoting space sciences to thousands of young New Zealanders.



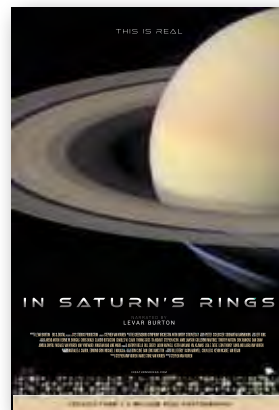
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Karrie Berglund  
Digitalis Education Solutions, Inc.  
Bremerton, Washington 98337 USA  
karrie@digitaliseducation.com

## Trust is a two-way street

I have been thinking recently about the importance of trust in a live, interactive planetarium program. Without mutual trust, a truly interactive planetarium show—one that is built upon audience suggestions and questions—will most likely fall flat. The presenter is trusting the audience to respond to questions and requests, and the audience is trusting the presenter to treat them with respect.

Creating this mutual trust should start from the very first group interaction. I typically open my programs with my name and then, “What do you already know about (our program topic)?” I take four or five responses, being mindful to call on people in different parts of the dome. This accomplishes a few key things:

It tells the audience that I expect them to actively participate; I want them to give me ideas and information, not just absorb what I say or show. If I have the opportunity to interact with members before the show begins (collecting tickets, welcoming them at the door, etc.), then I can set the expectation even more firmly.

Everyone should have at least one answer to this opening question. If they’re at a planetarium show on Mars, for example, chances are they already have an interest in and know a few facts about Mars.

On the off chance that no one had an answer to my opening question, I would simply change it to, “What do you want to know about Mars?” In more than 20 years of planetarium presentations, I’ve never had to make this change, but I keep it in mind just in case.

Taking a few answers to this question gives me a sense of whether the audience knows a lot or only a little about the program topic. If they are very familiar with the topic, I skip the lower level content and move on to more advanced topics.

### Responses control trust

How I react to audience members’ suggestions at any point in the program plays a big role in supporting or destroying trust. However, my reactions to the earliest responses are the most critical: If I make a joke at an audience member’s expense or belittle a suggestion near the beginning of the program, no one is going to respond to any of my future questions, and that is going to make for a very long program.

One of the most difficult aspects of presenting a live, interactive planetarium program is becoming comfortable with risk. Trust and risk are linked: If someone trusts me, they are willing to take a risk by answering my question. I am taking a risk just by posing the question, as any or all of these things could happen:

I may get answers that have absolutely nothing to do with the

program topic. Think of the 5-year-old who wants to tell you about his/her dog when your program is about the sun. I suggest that you acknowledge the comment with something like, “I love dogs, too. Let’s talk about dogs after we learn about the sun. Who can tell me something about the sun?”

If need be, I’ll ask immediately ask a very focused question like, “What color is the sun?” A very directed question reduces the likelihood of the child thinking about a different topic.

I may not know if the person’s answer is accurate. My standard response in this situation is, “I’ve never heard that before. That’s really interesting, and I’m going to look into it later.” This demonstrates that:

- I do not know everything.
- It is okay to admit when you don’t know something.
- I am interested in learning new things.

I may get answers that are simply wrong. For example, someone may tell me that seasons result from the earth being closer to the sun during some parts of the year. In my opinion, this is one of the best reasons to ask that opening question; you have the rest of the program to explore it fully and (hopefully) eradicate the misconception.

I try to find something accurate in the person’s statement to acknowledge, such as, “Earth’s orbit is not a circle. You’re right that we are indeed closer to the sun for some parts of the year. We’ll be exploring that concept later...”

There is a well known improvisational comedy exercise called “Yes, and” that helps presenters become comfortable following any suggestion. If you are not familiar with this exercise, this webpage describes it and includes some examples: [www.thoughtco.com/yes-and-improv-game-2713213](http://www.thoughtco.com/yes-and-improv-game-2713213)

“Yes, and...” is fantastic for live, interactive planetarium shows, and it applies in the business world as well. The quote below is from a group called improv4, which offers improv comedy workshops to businesses:

*“...you’re having a team meeting and some contributors on the team are sharing ideas. For every “no” you say you’re discouraging the contributors from sharing ideas in the future. Sure you won’t be able to incorporate every idea, but the point is to acknowledge someone’s ideas so that they feel their ideas are at least listened to and considered. This encourages sharing ideas in the future as well.”*

Consider a brainstorming session. The goal is to first generate a list of possibilities without regard for how easy or hard it will be to implement the suggestion; this is supposed to encourage creative problem solving. After the initial round, suggestions are evaluated, and only the possibilities that can be accomplished move forward.



A screenshot of Improv4’s homepage. They offer workshops focused on improvisational comedy exercises for businesses. Learn more at [www.improv4.com/](http://www.improv4.com/)

Karrie Berglund is the director of education for Digitalis Education Solutions, Inc. and leads the Vision 2020 initiative on professional development. She is a former director of the Willard Smith Planetarium at Pacific Science Center in Seattle, Washington, USA.

<https://medium.com/improv4/saying-yes-and-a-principle-for-improv-business-life-fd050bccf7e3>



Left: A LIPS-style classroom presentation often uses small group idea generation before the large group discussion. This 2017 workshop had small groups moving around the room to add ideas to various lists. This can help shy audience members share feedback, as they are more likely to contribute to a small group than to the entire audience. Photo: Dr. Tim Slater. Right: A LIPS-style workshop at IPS 2016 had participants working in small groups to design activities targeting different learning styles before presenting to the entire group. Photo credit: Karrie Berglund.

If you have ever been in a brainstorming session with someone who criticizes initial ideas, you have probably seen that suggestions dwindle and usually become much less creative. The criticizer destroys the trust that is required for the others to take the risk of making suggestions, especially creative ideas.

It is important to note that you can still say yes to a suggestion even if it is wildly off-topic (like the 5-year-old talking about a dog) or incorrect (such as seasons being caused by Earth's distance from the sun). Saying yes means acknowledging the comment and not making the contributor feel humiliated.

In the seasons misconception above, I said yes to the suggestion and only reinforced the part that was correct: "You're right that we are indeed closer to the sun for some parts of the year. We'll be exploring that concept later..." Although I may be tempted to say, "Yes, I have heard that idea before, and later I'll show you how very wrong it is," that would destroy the trust I need to create to have a successful program.

If you find that you are not getting many audiences responses during a live, interactive program, here are some suggestions:

- If you interact with audience members before the program, make those interactions positive. If an audience member has had a positive experience with you, he/she is more likely to speak up during the program.
- Make your first question open-ended and broad, so that everyone is likely to be able to answer.
- If no one answers your first question, try changing to a question that everyone can answer at the same time. For example, instead of "What do you know about the sun?," you might try, "How many of you see the sun in our planetarium sky? If you see the sun, please point to it." There is safety in numbers, so people are more likely to respond as part of a group.

Evaluate your responses to audience suggestions to see if you are saying no to the audience. Even better, have someone else observe you and give feedback, or record yourself, and listen to your presentation later. NOTE: Record audio only for legal reasons (no photo releases), and I strongly suggest telling the audience that you are creating an audio recording.

Remember that trust has to be earned. I find that once trust is broken, it is harder to earn back.

Don't be afraid to admit you don't know something. As the presenter, the audience typically thinks of you as an expert. If an expert is willing to say "I don't know," it is inherently easier for an audience member to admit it.

If your audience just seems shy in general, try having them discuss a question in small groups first, and then ask for responses.

If possible, move around the dome when asking questions. Many people are more likely to speak up if they can do so quietly—i.e., when you are close to them rather than across the dome.

In my next LIP Service column I will have the pleasure of summarizing LIPS 2019, held August 14-16 at Cradle of Aviation in Garden City, New York. There were a few sessions that will address this issue of trust and risk, so stay tuned for some follow up comments!

If you want to join the LIPS community or learn about LIPS-style events, there are two main options:

LIPS Facebook group: Search for "Live Interactive Planetarium Symposium," and then send a request to join. It is a closed group, but I try to approve requests very quickly.

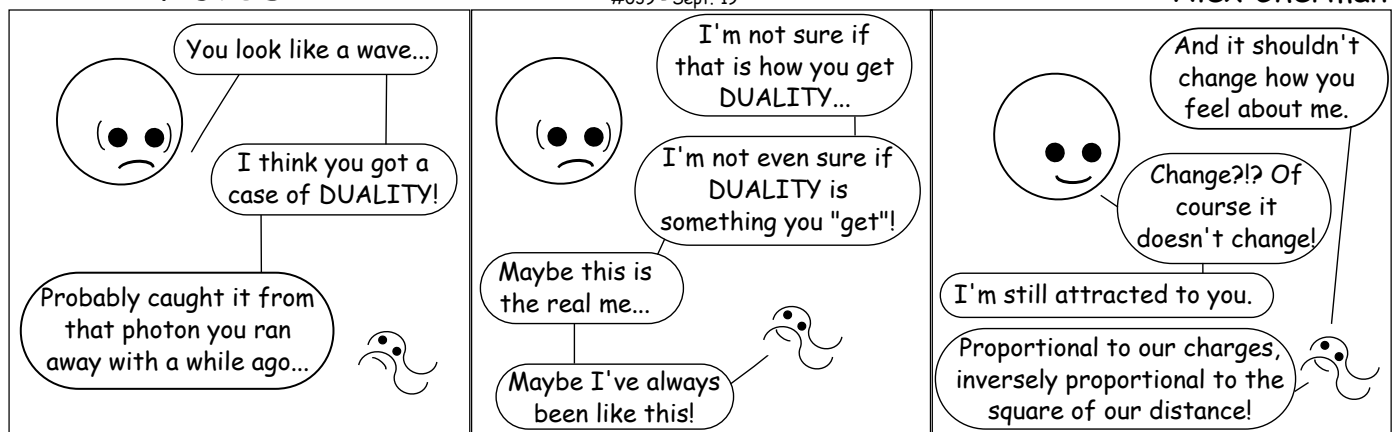
Email me asking for an invitation to the LIPS Google Group.

As always, I invite you to send feedback directly to me: karrie@DigitalisEducation.com. ☆

## PARTYcles

#039 - Sept. '19

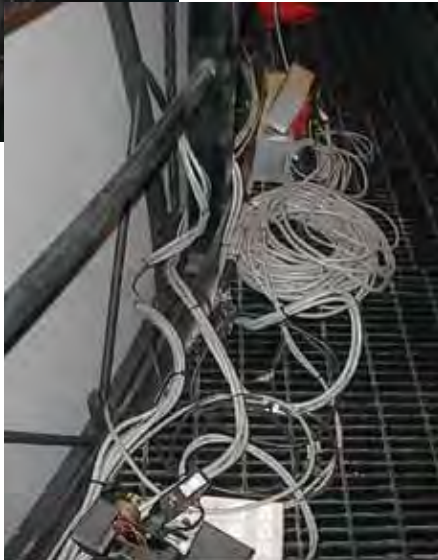
Alex Cherman





Jeff Bowen  
Bowen Technovation  
7999 East 88th Street  
Indianapolis, Indiana 46256 USA  
+1 317-863-0525  
jeffb@bowentechnovation.com

### Upgrading and renovations: your assignments



Top: Make sure your RFP describes who demos out the old stuff and how it gets disposed. Right: And don't forget to take photos behind the dome! All photos courtesy the author.

Two issues ago I wrote about new construction and included glossary terms and procedures commonly used in the design of such a project. This issue addresses renovation and upgrade of existing facilities. You might want to read the September 2018 column to relearn some of the terms used here. There are so many acronyms here you would think NASA wrote this.

#### Division of scope. Who does what and when?

The project will be divided into categories appropriate for various types of vendors with each having a defined SOW (scope of work). Vendors see almost all the questions and answers for as RFP (request for proposal) and RFQ (request for qualifications) that are issued by owners (that is your institution) and asked by various other vendors. Most of the poorly written and confusing RFPs mix various SOW in ways that makes it nearly impossible to accurately quote the project. Here are some common problems:

**The bad:** Too many unrelated trades/services included in one RFP. An example is including all the electrical, carpeting, seating, wall construction, dome, projection, sound, etc. in one document. Although some specialized planetarium vendors can include most of these in a contract, it is not the best use of their skills and actually brings a lot of frustration to the project.

Because a number of these services would be subcontracted, this

runs up cost due to the risk assumed by the vendor. So, most vendors just exclude these from their proposal. Often the institution then awards the Prime Contract to a general contractor (GC), to an electrical contractor (EC), construction manager (CM), or general trades construction company. These companies then subcontract the actual planetarium dome and electronics packages and perform all the demolition, construction, electrical, HVAC, etc.

**The good:** This wraps up the contract, payments, warranty, and responsibility in one package contract for your administration. If properly conducted this should eliminate any gaps in scope.

**The cautions:** Runs up costs. Blurred lines of warranty support. Lack of experience in domed theater projects by GCs, ECs, CMs. Most GC and CMs only want to perform their part of the contract and only add the planetarium specialties because they must to get the contract. This method is only helpful to administrations.

#### Owner responsibilities

Here are some things you need to do on your end to properly prepare for the RFP. Without these you will just be deluged with questions and it will slow down the project for months. It will also lead to you not getting everything you want/need. Feel free to use this list with your facilities people as an actual check list.

1. Make a sketch or drawing of your site. If these can be in some electronic CAD format that would be super good. Include these following notes:
  - Current dome diameter.
  - Current dome manufacturer.
  - Tilt of the dome, if any.
  - Height of base ring AFF (above finished floor).
  - Cove light trough width and depth.
  - Equipment room with dimensions.
  - Console area dimensions and distance to walls.
  - What size is the opening for access behind the dome? Some equipment (speakers, etc.) may be too large to fit through the opening.
  - Photos for all the above.
  - Location of power and/or dimmer panel(s).
2. Note where conduits, floor trenches to the "pit" area, etc. are and their associated distances.
3. Take tons of photos from all angles, inside the cove trough, behind the dome, in the equipment room. You can't take too many pics.
4. Write a spec for each system and the dome. Using an AIA format is best for all. I described this in the September 2018 Sound Advice.
5. Make a detailed list of current equipment with photos. Note if any are to be reused.
6. Describe the staging area where equipment will be assembled prior to installation with photos. Is this a hallway with traffic? Is the area closed off for the work?

Jeff Bowen has worked worldwide as a planetarium and exhibit specialist since 1985 and has been named a Fellow of GLPA and IPS.

7. Note any access restrictions to the site. Elevators available? Is the use of a stairway to access the site necessary? These possible access restrictions are important for the bidding process.
8. Understand that at least some electrical work will be needed. So don't let yourself be surprised.

### RFPs and bidding

1. Start the RFP with a brief description of the project and objectives for the next 10 years.
2. State that the bidder's response is a quote, not an estimate. The two are different.
3. List any insurance and licensing requirements right up front. This is important and most planetarium vendors don't have many of the needed licenses for some locations and might need to go through a licensing test and cost to include these.
4. Is any assurance bond required?
5. Request a certificate of insurance in the proposal. This eliminates any guessing or later surprises.
6. List any union or prevailing wage requirements. If you do not state this is the RFP, it will be the very first question asked.
7. List any OSHA certification or safety training required for the project.
8. Write a spec with sketches or drawings for any electrical and construction work. Don't just say "included as needed." No one can bid this accurately without a spec.
9. Include a proposed schedule.
10. Include the proposed dates and hours the site will be available for work.



It's more fun when it is over! Gail Chaid and Benjamin Mendelsohn celebrate upgrades to the San Jose school planetarium. Gail provided the veggie egg rolls!

### Want more?

Feel free to contact me for templates or more information. This is all free to you as a valued member of IPS.

With thanks to Mark Trotter, Bowen Technovation, who co-wrote this article. Mark served as a planetarium director in Louisiana for more than 25 years and is an IPS Fellow.

☆

EDUCATIONAL, ENTERTAINING, ENGAGING

# *BAYS MOUNTAIN PRODUCTIONS*



## SCIENCE AT ITS BEST

[BAYSMOUNTAIN.COM/PLANETARIUM-PRODUCTIONS/](http://BAYSMOUNTAIN.COM/PLANETARIUM-PRODUCTIONS/)



Tom Callen  
Vaxholm, Sweden  
tcallen08@gmail.com

## How permanent our work as planetarians might, or might not, be...

Probably most people at least one time in their careers stop and assess just what it is that they have accomplished or what their legacy might be. It wouldn't surprise me if it didn't happen more than that during a career lasting for decades. I have been thinking about this off and on of late in the context of what it has been like to have worked for many decades in our profession under the domed universe. It also led me to think about permanence and just what exactly we leave behind while we make our way, as we are oft fond of saying, around the sun for another orbit.

With the birth of the projection planetarium—soon a hundred years ago—all it took was the giant bug-like star projector itself, a large pointer that was probably plugged into the control console with a long cord, and a talented individual who was able to hold an audience enthralled as they talked about the wonders of the night sky in all its dazzling clarity.

### Always adding to the experience

As technology was added, things like a control console-mounted projector that showed 4" x 5" slides one-at-a-time added to the celestial excursions under the dome, highlighting something that the star projector, limited to the naked eye sky, could not show in any detail. Sooner or later, someone added a turntable, an amplifier, and speakers to play music as the audience filed in and out of the room, but probably not during the actual talk itself. That would come later.

I recall a story that one of the original staffers at the Albert Einstein Planetarium—then the Albert Einstein Spacearium—told about when they were touring some planetariums in, at the time, West Germany. As they entered the theater with the audience, there was some appropriate music playing in the background as they made their way to their seats. Finally, they said among themselves, a theater that might share similar production values to what they wanted to do with the planetarium planned for the National Air and Space Museum being built, but it was not to be. At the start of the presentation, the person at the console whipped the needle across and off of the 33<sup>1/3</sup> LP record that was playing—*Skrrrrccch!*—and they snapped off all the entrance lighting, plunging the room into total darkness.

Fast forward a little more in time and 35mm slide projectors began to show up, followed by some simple special effects projectors and then pre-recorded soundtracks on reel to reel tape. It has to be at this point that the first bit of permanence in what we do becomes a possibility, albeit in the form of boxes of circular slide trays stuffed with chips of slide film held in little squares of glass and plastic, as well as assorted boxes full of reels of magnetic tape.

### We had shelves full of odds and ends

For those of us who were part of the "analogue" days of presentations, the shelves and closets full of such odds and ends as well as the modified motorized projectors used to project comets, rotating galaxies, solar eclipses—whatever needed to be depicted at the time in our current understanding of the universe—was what we cut our teeth on. If a show was simple enough, it could be sold to another theater that tried to adapt (or is it adopt?) it to the best fit for their current technol-

ogy, since there were no two planetariums in the world that were identical to one another.

That didn't happen, to the best of my knowledge, until the opening of twin theaters in Aarhus and Jels, Denmark in the 1990s. One could call this a kind of *permanence* through distribution.

Semi-automation and full automation control systems made it possible for a presentation made up of many dozens of media devices to be given without a trained or knowledgeable planetarian in the control console, and, in many cases, this led to another form of permanence. A show could be delivered exactly the same way time and time again. It was even possible to uninstall it and, at a future date, bring it back in reprise as long as all of the produced media and special effects projectors could be retained.

Nowadays, we find ourselves in the age of "fulldome video" where a program (and it doesn't even have to be astronomy or even science related anymore) is created by a production studio, sometimes even in-house if a facility is fortunate enough to have the computational resources and artistic staff to do so. Gone are all the analogue "fiddly bits"—slides, special effects projectors, movie film, all-sky systems, etc.—replaced with a fully-formed digital show that gets "sliced and diced" and projected onto your dome via a number of video projectors whose images are neatly blended together, often with the choice of what language you would like the surround sound audio in.

This has to be the ultimate permanence, as such a production can long outlive those who created it and it will remain useful as long as its contents are relevant: a constant concern for writers and producers who hope for it to have a useful shelf life.

And, in spite of this, there are still those planetaria that do just live talks (everyone should be doing this regardless of their technology just for the sake of audience interaction) and even those that are still working in the analogue domain, which also might go by the wayside.

### What can we say of permanence?

If we reflect on all the talks/shows/presentations given over the last nearly one hundred years, what is it that we can say of our work that has any permanence?

To me, it all boils down to one central thing. In spite of the older forms being lost to time due to lack of "capture and save," they can be consid-



ered to be just as long-lasting due to their common thread: the effect on the viewers who saw them. Many of us who have made this our chosen profession can recall with great clarity that moment that made us decide that this is what we wanted to do.

And while the hundreds, thousands, and tens of thousands of school children, families, assorted adults and seniors that we have interacted with over the decades may not have gone down that same path, I am sure that

there have been more than a few who have paused, looked up at the night sky, and couldn't help but wonder as a direct result. ☆

# It's the little things...

This close to the surface, details matter. Overlaps, crimps, folds, and exposed rivets will affect your image. Perfect projection is only possible on a perfectly uniform surface. NanoSeam™ has no irregularities in the surface. None. It's why the most prestigious venues choose Spitz domes - including The Adler, The Hayden, and our partners like IMAX, Disney, Universal Studios, and Seaworld.

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Susan Reynolds Button  
Quarks to Clusters  
8793 Horseshoe Lane  
Chittenango, New York 13037 USA  
+1 315-687-5371  
sbuttonq2c@gmail.com  
quarkstoclusters.wordpress.com

### Perfection: a mobile dome and super dark skies North Carolina

Early in February of 2017 I received an email from Brian Baker, director of Astronomy at A Time for Science. He wrote, "I am looking for some help finding information on how mobile planetariums positively affect the people they serve. I am preparing for a grant to fund planetarium visits by the many low income schools in Eastern North Carolina who are unable to take advantage of this great resource. Our outreach program is just in its infancy and gaining traction, so we do not have a lot to draw on. If possible could you refer me to any people, reports, or websites?"

#### Seeking help from our friends

While there is little research specific to portable domes, there was one resource I could think of to provide some concrete information:



the Discovery Dome folks in Houston, Carolyn Sumners and Patricia Reiff, who have done some research and lots of outreach with mobile domes.

So we reached out to them and Pat replied:

"Carolyn has many publications on how students are reached in portables (she reaches 70,000-80,000 a year in portables). She and I did a student study



Top: The Discovery Dome on the national Mall for the annual Astronomy at the Mall event in Washington, DC; Left: the dome on the White House Lawn for Astronomy Day in 2016. Photos provided by Patricia Reiff.

on retention.<sup>1</sup> We took 200 middle school students, did pretests, then half saw one of our shows in a portable dome and half on a flatscreen; same videos, same soundtrack, but not immersive. Post-test immediately after the showing: both groups learned (good content). However, we re-tested the students six weeks later and the students who saw it in the dome essentially forgot nothing, but the ones on the flatscreen lost 2/3 of their gains.

"We also reach about 10,000 people a year in portables for outreach events, not counting NSTA, ASTC, and IPS, which have a sales component, but also an outreach component. For example, at ASTC we allowed two other groups to use our dome to show off their content.

<sup>1</sup> Zimmerman, Laurie and Spillane, Stacia and Reiff, Patricia and Summers, Carolyn (2014) "Comparison of student learning about space in immersive and computer environments." *Journal and Review of Astronomy Education and Outreach*, 1 (1) A5-A20.

We use essentially all of the profits from my company for public outreach events.

"Our newest development is an easy viewer for 360VR fullsphere movies... you can make it a group event and show any half of it on the dome (joystick around). You can stop it, move around the scene, teach with it and not just have it as a personal viewing. We have trademarked it 'Share the VR!'

"We took the dome to the childrens' cancer hospital. A child even came in with an IV pole!

"We have a 'free dome loaner' program and the dome has gone many places including the Kennedy Space Center for the MMS launch. (We paid all expenses including shipping and having an operator on duty for them)."

Brian responded to Pat,

"Thank you so much! This is very helpful, exactly what I was looking for. It is so wonderful to be referred to you and Dr. Carolyn Sumner. I got my start as a planetarium instructor at the Challenger Learning Center in Tallahassee, Florida. I was there for 8 years as I worked my way through college. I absolutely love the organization and its mission. The Challenger totally changed my life and led me to pursue studying astrophysics. I am sad not to work there anymore, I only left a year ago, but I have this great opportunity at a local start-up learning center in eastern North Carolina. I know that my experience from the Challenger Learning Center is going to make all the difference. Thank you for everything you both have done for me now and in the past."

#### Look to the research in the field

I also shared another source of research with Brian. I pointed him to a paper that was delivered at the 2015 GLPA conference. It was called "Connecting Field Trips to Classroom Learning: Using the Planetarium to Support Students' Engagement in Science Practices" by Dr. Julia Plummer.<sup>2</sup>

Also suggested: "Using a planetarium fieldtrip to engage young children in three-dimensional learning through representations, patterns, and lunar phenomena" co-written with Kim Small. The paper is under review at the *International Journal of Science Education, Part B*. It is available online ahead of print.<sup>3</sup>

Julia sent these comments to Brian, "I don't research specifically on mobile planetariums. All of my research is with fixed domes. However, I believe the findings of such studies are transferable.

"The study Susan suggested is one I currently have under review. Some of my papers are linked here: [juliaplummer.com/publications.html](http://juliaplummer.com/publications.html).

"In Plummer, Kocareli, & Slagle (2014), we looked at how different instructional settings (classroom alone, planetarium alone, and planetarium+classroom) supported children's explanations. We found significant improvement when children had both the planetarium and classroom instruction, over the other conditions.

That study built on my earlier research looking at ways to use the

<sup>2</sup> The video can be seen at <http://glpa.org/conference/2015/plummer>

<sup>3</sup> <http://juliaplummer.com/papers/Plummer-Small-2018.pdf>

planetarium to support young children's descriptions of how objects appear to move in the sky. In Plummer (2009, *Journal of Research in Science Teaching*), I discussed the significant improvement 1st and 2nd graders showed in their descriptions of the apparent motion of the sun, moon, stars after a single kinaesthetic planetarium show. In Plummer & Krajcik (2010), I compared those children to another study I did with 1st, 3rd, and 8th graders (who did not go to the planetarium). The 1st and 2nd graders who went to the planetarium were at least as good if not better at describing those motions than the 8th graders."

Contact information: Julia D. Plummer, Pennsylvania State University, University Park, Pennsylvania, dp17@psu.edu and Kim J. Small, Arcadia University, Glenside, Pennsylvania and Upper Dublin School District, Maple Glen, Pennsylvania, kimjsmall@juno.com.

## Nice to meet you in South Carolina!

Fast forward to 2019, I was delighted to meet Brian in person at the SEPA/MAPS conference in South Carolina this June. He gave a paper,



Pictured above are participants in an outreach program called "Step into Stem," where we served 10,000 4th graders in eastern North Carolina last year! That program includes the mobile planetarium, live electricity and magnetism demonstrations, and a hands-on fossil dig. Brian explained, "Essentially we roll up to a school and hit up to 80% of their 4th grade science curriculum in an hour and a half. It was a lot of fun but very exhausting!" At right: A star party in Bertie County. Photos provided by Brian Baker



"Researching the Night Sky and Nocturnal Environment of the Outer Albemarle Peninsula," that described the progress he has made in building a successful program and conducting some valuable research.

I learned that eastern North Carolina has some of the darkest skies along the Atlantic Coast of the United States! I certainly enjoyed and learned a lot from this paper, in which Brian states, "A qualitative survey of the vast public lands of the Outer Albemarle Peninsula (OAP) was performed to gain insight towards the night-scape resources and the nocturnal environment of the region. Ground level night sky quality readings ranged between 21.3–21.81 magnitudes per square arcsecond. Public star party events featuring a mobile planetarium and local amateur astronomers reached 1000 people gaining support and awareness for the project."

The paper describes the research methods used and data gathered to date which indicated that, with further research, the OAP may qualify for the highest tier designation of the IDA Dark Sky Parks Program!

Susan Button is a past president of IPS and has chaired the Portable Planetarium Committee since 1988. She is a retired portable planetarium director for the Onondaga Cortland Madison BOCES in Syracuse, New York, USA.

Brian explains, "Two public star parties were held within the survey area. The events consisted of a mobile planetarium, several hands on activities, and telescope viewing hosted by local amateur astronomers. The mobile planetarium featured a live night sky tour highlighting the morning planets, the Orion nebula, and the uniqueness of the dark sky conditions in the area. Following the night sky tour the fulldome short film *Losing the Dark* was shown to the audience. The film introduces and illustrates some of the issues regarding light pollution and suggests three simple actions people can take to help mitigate it.

"One final outreach event is planned to serve Tyrrell County Public Schools. Each grade level from K-8 will have their opportunity to go through the mobile planetarium to learn about the exceptional night sky they have about them."

I asked what portable planetarium system he chose to use and he replied "We run a Digitalis Digitarium Zeta portable system which has projected resolution of 1.13 megapixels. We use two domes, a 5m that can seat 25 and a 7m that can seat 45. With the outreach events for the night sky survey we only used the 7m dome. As you noticed it is strictly for indoor use only. I love the system and have no complaints about it. I am very excited to upgrade the system from Nightshade legacy to Nightshade NG in the next few months once things die down after summer."

I asked how he handled crowd control for his bigger events. And he said "Crowd control is tricky. I have not perfected the art. For large open-to-the-public events I like to use a ticket system, where a limited amount of tickets for each showing are distributed at booth located some distance away from the dome. Tickets for each showing are distributed no more 30 minutes before a showing so that people don't wander off too far.

"If I have tape or stanchions available I will mark a line for people to queue up in a way that does not interfere with the people who will be coming out of the dome. If those things are not available I will use patterns or lines on the floor to mark where people can queue. To help get the most people possible through the planetarium I do shows every 30 minutes."

It is so exciting for Brian to share this research and for me to learn about such a wonderful dark

skylocation which is being made available for some great education, involvement of amateur astronomers and in the future for tourists too!

With the nearest stationary planetarium about 2 hours away, it was a great idea to involve a portable planetarium and Brian stated that it was a key factor in generating excitement about astronomy and the Outer Albemarle Peninsula. What a treasure this locality is. Follow Brian for more news in the future and maybe you will want to attend a star party there!

Contact Information: Brian Baker, director of astronomy, A Time For Science, (+1) 252-364-6569, brian@atimeforscience.org, www.atimeforscience.org.

As all of you know who have read the June 2019 *Planetarian*, you can now find much more supportive information about the value of planetariums and research that has been done to support planetariums in education. Even though I was unable, at the time, to point Brian in that direction I am so happy to see that he is developing a very successful program none the less.

Go to [www.ips-planetarium.org/page/planetariumeducationvalue](http://www.ips-planetarium.org/page/planetariumeducationvalue) for the official IPS white paper about the value of planetariums (long and short forms) and read Sharon Shanks' article "Where's the Data?"

(Continues on next page)

on pages 12-15 of the June 2019 *Planetarian*. Then go to <http://istardb.org> to find more papers relevant to this topic.

## Homemade digital projector

Ruth Grützbauch is one of the winners for the 2019 Week in the United States; she will travel to Maine in September. She is a portable planetarium director and sent a picture of her with her very small projector. I was so curious about this system that I asked her to tell me more about it. I think I will try to build one of my own!

She wrote, "I have built the system with a few photographic lenses and a small projector following the instructions here: <http://www.lss-planetariums.info/index.php?lang=en&menu=projector&page=lss-basic> (scroll down to "Simplified setup without 3D printing").

"I have used a second-hand Peleng fisheye and SMC Tacumar lens and a small diagonal mirror from my local telescope shop. I have then built the small frame to align the projector & lenses with metal brackets from the DIY store and attached them to a basic telescope tripod. It was quite a lot of trial & error and playing around with little bits to get it to work, but it's a beautifully simple & cheap solution to make your own planetarium."

Contact Ruth for any more technical questions: [hello@publicspace.at](mailto:hello@publicspace.at). There are also links on the IPS website for building your own system. [www.ips-planetarium.org/page/portableresources](http://www.ips-planetarium.org/page/portableresources). ☆



Clockwise, from lower left: Ruth and her homemade fisheye projector. Everything you need to present a fantastic show! Experimenting with the projector set up. The Peleng fisheye and SMC Tacumar lens are attached to diagonal mirror. Everything fits in a small compact bag; that is perfect for a mobile dome director. All photos provided by Ruth Grützbauch.

## Atlas of the Starry Skies: Call for contributors

The Kulturstiftung des Bundes (The German Federal Cultural Foundation) is funding the project Atlas der Sternenhimmel (Atlas of the Starry Skies), a comprehensive documentation of the night sky as seen by native and historic cultures worldwide. The focus lies less on the history of astronomy per se than on the significance and sociological relevance of the asterisms different cultures saw in their skies.

It is our goal to collect the names of the stars, planets, and constellations along with the legends and cultural backgrounds linked to them worldwide: from the Inuit to the Xhosa, from Native Americans to indigenous cultures in South America, from the Maori to the Philippines—wherever enough material is available to map these indigenous skies. The project is thus ethno-astronomical in nature and aims to preserve the intangible heritage of different world cultures.

The project is already well underway, with the documentation of the Old Egyptian, Mesopotamian, Arabian, and Tuareg night skies near completion. Access to research on the asterisms of China, India, and African cultures, however, proves difficult. That is the reason for this call for contributors and information. Should you be working in these fields of study or know of any available research—no matter which culture—we would be glad to hear from you.

Head of Project is Raoul Schrott, a multilingual Austrian who has a Ph.D. in comparative studies and teaches at the universities of Bern, Innsbruck, and Tübingen. His most recent publication, *Erste Erde. Epos*

(*First Earth. Epic*), presented narrative and scientific summaries of our knowledge of the Big Bang to the origin of the Earth, life, and humans up to the invention of writing. When not working on the compilation and presentation of research already undertaken by scholars and ethnologists, he is travelling to collect data.

The knowledge of indigenous cultures of their own skies and starlore is dying out while at the same time being protected from outsiders. We are well aware of the repercussions of western appropriations of these cultures: our intention is to document autochthonous skies as respectfully and conscientiously as possible. Our sole purpose is the preservation of this knowledge by sharing it, in order for researchers, teachers and local planetariums to pass them on to their respective audiences.

Working with the materials collected by Raoul Schrott, the Stiftung Planetarium Berlin (The Foundation of the Berlin Planetariums) will then produce an overall map with culturally neutral graphics of the constellations, together with animated episodes of starlore for 3D full-dome projections. The whole package will then be made available for free by the Stiftung Planetarium Berlin, in a database with open access that can also be used for further research.

If you have knowledge that would allow us to comprehensively map a historic and/or autochthonous night sky together with its starlore, please reach out to Raoul Schrott at [atlas@planetarium.berlin](mailto:atlas@planetarium.berlin). ☆



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April S. Whitt  
Fernbank Science Center  
156 Heaton Park Drive NE  
Atlanta, Georgia 30307 USA  
april.whitt@fernbank.edu

### Suburban observing, the AMNH, and hope for the planet

#### *Stargazing Under Suburban Skies: A Star-Hopper's Guide*

Malcolm Zack, Andrew Gannon, and John McRoberts, Switzerland: Springer Press, 2018.

Reviewed by Francine Jackson, Ladd Observatory, Providence, Rhode Island, USA.

Many of us in the planetarium field spend a lot of time enjoying the sky inside our domes, but, occasionally, it might be a nice idea to go outside and enjoy the real thing. If you are not someone who has much experience with the great outdoors, this book is a must.

Early in the book, you are introduced to binoculars and all the various telescopes that a first purchaser might want to look into, plus cameras, and even the proper chair. Then, in Chapter 4, you are treated to a tour of the 100 fairly easy-to-spot deep-sky objects such as you've never seen before in a book. Each one gives its actual and any alternative names, what it is, where it is, its apparent magnitude, and even its distance. There is then a paragraph on why the authors like it, and chose it for this collection. Following that is the best time to observe it, and whether it's best naked eye, through binoculars, or with a telescope. The next page has a sketch of where it is, and how to star-hop to it. The final image is the actual object as seen through a fairly small telescope.

The next chapter is the same format, but with the moon. Again, the authors describe the feature, why they like it, where it is on the surface, and a beautiful image of the object through their amateur telescopes.

And, don't forget the planets! Each one, up to Uranus, is shown—although the image of Mercury is placed against the sun, from the 2016 transit. In addition, there are tables for both elongations and inferior conjunctions of Mercury and Venus, plus oppositions of the outer planets (sorry, no Pluto).

Another chapter lists the best apps and software for both observing and imaging, and some handy tips on making your images the best ever. There are even several pages on the "other phenomena," such as eclipses, meteor showers, and comets.

*Stargazing under Suburban Skies* is one of the best introductions to going outside and becoming familiar with whatever you are able to observe from your backyard. Even someone with knowledge of the sky would welcome this as a part of their observing collection. It's one that should be on all of our bookshelves.



#### *The American Museum of Natural History and How It Got That Way*

Colin Davey with Thomas A. Lesser, Fordham University Press, 2019

Reviewed by Jordan D. Marché II, University of Wisconsin-Madison, USA<sup>1</sup>

While not the builder of the first U.S. planetarium, New York's American Museum of Natural History (AMNH) has nonetheless been at the forefront of numerous innovations in scientific exploration and museum education. Only now has it received its first in-depth historical treatment spanning the 150 years of its development.

This volume, written by Oregon software engineer Colin Davey, was inspired by the many visits that he made to the museum as a youth; visits that likewise exposed him to the wonders of the original Hayden Planetarium. A particular emphasis of the book is the manner by which the museum's many great halls grew in fits and starts under a host of visionary leaders and explorers. Yet, its frequent additions have remained loyal (for the most part) to the 1872 "master plan," designed around a Greek cross encased inside a square box that was conceived by its original architects. Part I of the book thus addresses "The American Museum and How It Got That Way."

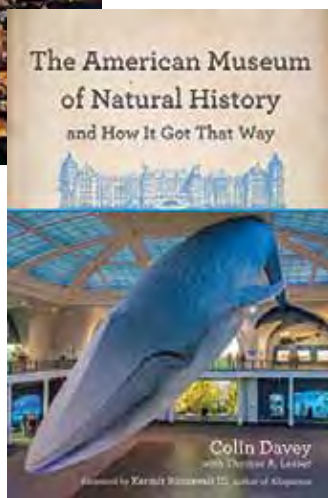
Davey recounts in engaging detail the heroic struggles of U.S. Navy engineer and arctic explorer Admiral Robert Peary to find and recover the three Cape York meteorites, including the largest (34-ton) specimen, named "Ahnighito," from northwestern Greenland, over a six-year period (1891-1897). Peary's arctic ventures were largely supported by Museum president Morris K. Jessup and still later by Theodore Roosevelt.

Those meteorites formed the basis of the museum's first (but short-lived) astronomical exhibits, starting in 1906, which included a large model of the solar system and astronomical "clock." Much more is also told of the planned five-story "Astronomic Hall," long championed by the next museum president, Henry Fairfield Osborn, but which was never constructed due to lack of private funds.

In retrospect, however, this may have been a blessing in disguise. Its deferral enabled museum officials to pursue a completely

different approach after the projection planetarium was unveiled in Germany.

Of greater interest to most readers of this journal will be "Part II: The Heavens in the Attic," co-authored with Thomas A. Lesser, formerly intern astronomer and senior lecturer at the Hayden Planetarium. Here, we are treated to a very well-researched account of the principal stages leading to the creation of the original Hayden Planetarium



April Whitt is an astronomy instructor at Fernbank Science Center in Atlanta, Georgia, USA. She shares that she is so old that she has flown on both the Kuiper Airborne Observatory (KAO) in 1995 and the Stratospheric Observatory for Infrared Astronomy (SOFIA) in 2015.

<sup>1</sup>Marché is well-known in the planetarium community as the author of *Theaters of Time and Space: American Planetaria, 1930–1970* (2005). He is a past editor of *Planetarium*, a fellow of IPS, and a senior lecturer in astronomy at UW-Madison.

(which opened in 1935); its subsequent educational impact, particularly in helping to shape pre-spaceflight expectations (aided by the visionary artwork of Chesley Bonestell) during the 1950s; through a host of post-Apollo dissatisfactions to restructure its traditional architecture and educational mission—plans which eventually culminated in its newer incarnation, the Rose Center for Earth and Space, that premiered in 2000. We also receive an early glimpse into the latest phase of the museum's ongoing development—the Gilder Center for Science, Education, and Innovation—that is slated for completion in 2021.

By focusing upon a single institution and its principal divisions, Davey and Lesser have opened significant new historical grounds that I was unable to adequately sift within my broader study of the American planetarium community. For example, they have demonstrated the influential role taken by Robert Moses, chairman of New York's State Emergency Public Works Commission, and its consolidated city Parks Commission, who readily adopted the model of a quasi-governmental "authority" to oversee large construction projects during the Great Depression. Along with the Planetarium Authority initiated by Museum president F. Trubee Davison, Moses submitted a package of such projects to the Reconstruction Finance Corporation (RFC) in 1933, and by his own admission, thereby "wangled the planetarium loan" (Moses, quoted on p. 147). But that is not all.

In his attempt to free the Hayden Planetarium from lingering debt (due to its non-repayment of the RFC loan through 1940), Moses sought out the assistance of industrial and theatrical designer Norman Bel Geddes. Bel Geddes led a team which conducted an independent evaluation of the planetarium's operations.

In his *Preliminary Report to the Hayden Planetarium Authority* (1941), he made a number of recommendations that, in retrospect, were far ahead of their time. Bel Geddes suggested that the planetarium's circular seating arrangement be replaced with "bleacher-style seats" arranged in a sloping, unidirectional pattern. He also urged that greater usage be made of special projectors (involving film, lighting, and sound effects) that provided audiences with an appearance of traveling through space and that performances should be pre-recorded. Another proposal was to extend the visual display downwards, below the dome's horizon, for a more theatrical viewing experience.

Yet, Moses later reported that this document "horrified the staff, was resented by most of the trustees, and was promptly buried." Bel Geddes's ideas were considered "too explosive, novel, unconventional, and unmathematical" to be acted on at the time (Moses, quoted on p. 156).

Not mentioned by Davey, however, was the fact that almost all of these recommendations had been successfully applied within the Theatre of Time and Space pavilion at the 1939 New York World's Fair. Still, the Bel Geddes Report offered the first serious consideration of these potential innovations within a major U.S. planetarium.

As readers of this journal are well aware, they were all adopted, either piecemeal or en masse, in the post-war era, influenced by the "space science classroom" approach to education and from the emergence of the IMAX/OMNIMAX entertainment media, among other factors. Some 60 years after the Bel Geddes Report, these changes were finally realized in New York City, with construction of the Rose Center and its Big Bang Theater.

Another chapter of particular interest describes, in time-capsule-like fashion, "A Visit to the Original Hayden Planetarium," in which not only the Sky Theater, but the institution's two floors of exhibits, plus its Copernican (i.e., ceiling) Planetarium, are characterized. Here, attention is also devoted to the preparation of the first black light murals, painted by artist Thomas Voter, which offered something of a 3-D perspective to viewers.

Other permanent exhibits included the elaborate "Astronomia," sponsored by IBM, that encompassed five hundred years of astronomi-

cal history, and the popular "Your Weight on Other Worlds."

This volume makes a valuable contribution to our knowledge of one of the most iconic American institutions devoted to science and popular education, especially regarding astronomy and space science, over the course of more than a century. Deeply researched and illustrated with 50 black-and-white period photos and numerous diagrams, the work is not only a pleasure to read, but will serve as a notable reference for years to come. Planetarians everywhere can benefit from a short to an in-depth perusal of its pages.

## *Climate of Hope: How Cities, Businesses and Citizens Can Save the Planet*

Michael Bloomberg and Carl Pope, New York: St. Martin's Press, 2017.

Reviewed by Francine Jackson

Surprisingly, the first question asked in this book is how could two people, one a known conservationist and former head of the Sierra Club and the other, a billionaire entrepreneur, come together and make a book on what is considered one of the major problems facing us in the fairly near future: climate change.

Michael Bloomberg, despite being known for his work in successful money-making enterprises, spent several years as mayor of New York City. During this time, he became a "boots-on-the-ground" realist

on the hazards that Manhattan was up against: the island is at sea level, there are millions of people living and working there, and city services and transportation systems were incredibly difficult to manage.

In many ways, he saw this as very comparable to the problems that had occurred with Hurricane Katrina in 2005. Add to that the devastation wrought by Hurricane Sandy in 2012, and Bloomberg's eyes were really opened to the difficulties facing, not only New York City, but much of the globe.

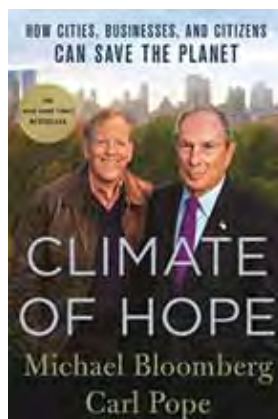
Carl Pope, especially in his work with the Sierra Club, has been monitoring changes in the environment for decades, and his meeting up with Bloomberg seemed the perfect fit to his continuation of watching, and coming up with, ideas and solutions to the problems that a change in climate could make.

Together they looked at all aspects of life, both in the United States and around the world: housing, food production, jobs, energy, and transportation. Each subject was studied separately and analyzed as to the best and least disruptive way to satisfy the communities observed. Some solutions were at first considered controversial, or downright impossible. As a small example, one of Bloomberg's assistants suggested taking out all traffic from Times Square. It worked.

One of the major problems both authors faced in this book was the issue of coal production and its effects on both humans and the land from which it is mined. Some of their potential solutions, although possibly considered virtually impossible at first glance, should be worth a try, as they saw their ideas as remaking the land workable without losing any jobs.

Throughout *Climate of Hope*, I could actually visualize the hope that the authors were condoning, and saw myself trying, in just a small way, to make changes in my life that, if many others did the same, would result in a better world. Imagine if many, after reading this thoroughly compelling book, also followed some of the smaller ideas, and were able to compel members of both governments and large industrial complexes to use this book as a way to work together. If so, then the authors would have done their part, and the world would be a better place to live.

☆





Ron Walker  
The Star Barn Planetarium  
P.O. Box 161  
Cave Creek, Arizona 85327-0161  
thestarbarn@gmail.com

## "Dream big," everyone said. So I did.

As some of you may or may not remember, my interest in planetariums began when I first saw a Zeiss II machine at the Adler Planetarium in Chicago. For some odd reason that initial impression never left me and continues to this day.

While I never really ever expected to ever have or play with a projector of this caliber, let alone have a 60ft plus dome to put it in, I also never even expected to come close.

"Dream big," everyone said, and I did. This past June I concluded my fifth full year of presenting shows with my half-scale Zeiss, a Minolta series IIB, under a 30ft dome. The thrill of doing shows has not abated at all; in fact it has intensified, as I realize the gift I have been given.

I am indeed the master of the universe. The true surprise is that my little experiment continues to draw people in, and in greater numbers each and every year.

Now most of you would probably consider it strange that anyone in their right mind (not that I am, as that has been speculated upon) would consider a dumbbell projector anything more than what it is. But for the amateur, it will always be more than a collection of motors, gears, and flashlights: it almost becomes a living entity for us. Mine is named BOB.

Before you gather collectively and plan to have me committed (or at least banned from these pages forever), I will point out that my name is listed under humor and on the brain spectrum, humor is close to being off one's rocker, in colloquial English.

### Another cock opera aria

And speaking of rocker, I will force upon you another of the spectacular arias from the (rock) Opera "Beyond The Sixth Magnitude," copyright Gareron Music, used with permission. This, my personal ode to my personal projector, has a kind of a western ballad motif.

#### My Minolta Song

In Texas where they like things big,  
The Minolta projector had its gig,  
For thirty two years it played its song,  
until they decided it had been too long.

Minolta, My Minolta,  
That big bright blue, projecting thing.  
That big bright blue, projection machine.

Replaced by computers and a great big lens,  
They said goodbye to this Mercedes-Benz.  
It just so happened I was wondering by,  
And offered a bid on this pie in the sky.

After 40 years as a commercial, industrial, and feature film maker, for Ron Walker controlling the universe in his "Star Barn Planetarium" was a natural step forward. He reports that surprisingly, viewers actually enjoy his shows, which unfortunately forces him to write new ones between naps.

Winning the bid was a joy I sought,  
Never thinking I'd reap what the big boys keep.  
But winning the bid was not the end of things,  
It was just the beginning of my biggest fling.

So I brought it home and had to start,  
Building a dome to hold its heart,  
And while that dome was being built,  
The projector was taken down to the hilt.

Replacing wires and replacing bulbs,  
All I remember are soldering smells.  
But in the end it all paid off,  
I wasn't really a big dummkopf.

So what started as a great big dream,  
Has turned into my pitcher of cream,  
And that once deserted Minolta machine,  
Has indeed become my big dream.

Minolta, My Minolta,  
That big bright blue, projecting thing.  
That big bright blue, projection machine.

This is another part from a larger collection of works from dedicated amateur planetarians who don't have much else to offer for the 100th year celebration of the invention. If you don't stop me now there will be another attempt next quarter.

And, speaking of celebration, the first and probably last amateur planetarian's confab will happen in March of next year. You're welcome to drop by if you're really bored. Planetarium Ale will be available; after all, Ken Miller and Kris McCall shouldn't have all the fun. (If that last line is confusing you must read on as it is explained somewhere below.)

Anyway, on to more entertaining things.

### Keith's captured quips, chapter eight

"Someone in our class said that they found a tenth planet."

"I liked the Show. It was naet. I don't know why I almost fill asleep."

"That is a good fieldtrip and I was vere sad and happy bot Msr. Wood side (said?) that I was asleep and I was not awake."

"I also learned there are things in the sky."

"I liked the star show. Even though I wasn't there. I had the flou."

### Ten years ago

**September (2009):** The cover shows a spectacular diamond ring of the total solar eclipse from India on July 22, 2009. Piyush Pandey explains the preparation for the eclipse all across India and the rewards on the day of presentation.

Next we have a look at London's only planetarium (yes, the good old Zeiss is no longer doing battle with the wax figures) and it happened to be placed directly on the Prime Meridian. Space educator Steve Tidey

tells us that part of the funding for the dome came from selling off 690 barrels of damp-spoiled gunpowder. Interesting what turns up in the dark damp corners of one's basement, isn't it. Yes, you guessed it, there is a planetarium at the Greenwich observatory.

I kind of wonder if all that gunpowder is for the cannon that marks the hour (do they still have that?).

Dr. Larry Krumenaker takes us on a visit to Russia's only high school planetarium. In a 10m dome sits one of the original Zeiss medium projectors sometimes referred to as a ZKP. Originally designed in the 60's, it still reproduces a typically beautiful Zeiss sky. That article goes on to explain the classes offered under the dome.

Christopher Reed continues to try to explain copyright law, which only confuses me more and more. Enough said as I don't need the extra headache.

Judith Rubin touches on the touchy subject of optomechanical vs. digital and says why not have both. This subject comes up at least once a year and will never be answered. I love that big ant that sits in the center of the room and I believe all who visit should pay homage to it.

One can wax eloquent via a live show for as long or short as one wants, and speaking of length (how is that for a segue), we have Steve Case doing some planetarium show reviews. Now, I'm not going to review his reviews because there are probably as many opinions as there are planetariums. Yes, what would you do if you had just bought *Nine Planets and Counting*, but I digress.

What I did note is that these programs average about 30 minutes in length. This is perhaps a compromise because most class periods are 45- to 50-minutes in length and a 30-minute program will fit in with all the other paperwork required for each class. My problem is that I like to interact with my viewers by asking questions along the way to see if anyone is still awake. I have a very hard time to keep any show down to an hour, let alone half an hour.

I can't finish the comments on this issue without a mention of the "Last Light" column by April Whitt in which we have a revealing picture of Ken Miller and Kris McCall chugging down on Woodchuck Ale. (And they call me the comic relief.)

## Twenty-five years ago

**September 1994:** Congrats to Munich's new planetarium! Stephen L. Rider and Thomas W. Kraupe tell us about their new Zeiss Mark VII projector, the first design after the reunification of East and West Germany. This is also the first projector to use fiber optics to project its 8900 stars. With 12,000 watts of six-channel sound, those with silver fillings should take care.

This is indeed a time of change, as this new overhaul still boasts the use of 82 slide projectors with 80-slot trays and a Sky-Skan control system. The thoughts of programming and keeping the system operational should cause some of you night sweats and sleepless nights.

I can remember when I thought that a laser disc player was the cat's meow, and this new system boasts six of them. To keep the NTSC images sharp there was a Faroudja line-doubler.

To round out the system, a Lobo laser system complete with smoke machine produces computer-controlled laser images to fill the dome. It took 25 years, but this is the kind of stuff I'm now playing with under my dome. Talk about trickle down!

In the article "Follow the Drinking Gourd," Gloria D. Rall talks about the history of the song, along with other points. While the article mentions no contemporary recordings, I have always liked the one recorded by the New Christy Minstrels on a 1963 Columbia LP. [www.youtube.com/watch?v=KENvfVInFLw](http://www.youtube.com/watch?v=KENvfVInFLw)

This performance appears to use the words as researched in the article and originally supposedly penned by Peg Leg Joe. Now if that doesn't pique your interest, I'm not sure what will.

Govert Schilling and Mark Spoelstra write about "DigiDome: Visual Wizardry for Planetariums." The article starts with the line "A revolution is taking place in the planetarium field. Its name is digital imagery." The first thing I imagined is another computerized system for generating imagery for the dome. Imagine my surprise when I read that the system is designed to make slides for use in slide projectors which are then projected on the dome. It is said the the software was very user-unfriendly to use and needed substantial computing power. You would need an IBM personal computer with 4 Mb of ram and a Windows 3.X operating system. I wonder if that is still supported, as I think I have a computer like that.

Wade E. Allen tells us of an Earth-destroying planetary alignment that is coming on May 5, 2000. For those of you who are at all worried, let me assure you that all is safe and you need not fret. You will probably will have more problems with your computer switching over on January 1, 2000.

More my speed, Richard McColman designs in "Planetechnica" a classic projector for Jupiter clouds. I love this old stuff: simple, cheap, and projects a rather good facsimiles of what's required.

A final note congratulates John Mosley as IPS presents its highest award for service for his editing of *Planetarian* for eight years.

While I never really comment on ads I must inform you that a new "Polychromatic Acousto Optic Modulator" is now available. That alone should get you looking into back issues right away. No, there is no Martian animated character involved.

## Forty-five years ago

**Fall/Winter 1974:** We have again a double issue with combined fall and winter. The cover depicts some modern Hopi sky art which ties in with an article by Von Del Chamberland titled "American Indian Interest in the Sky as Indicated in Legend, Rock Art, Ceremonial and Modern Art."

Paul DeHart Hurd presented a talk on "Science and Communication," which was transcribed and printed in this issue. Basically he speaks about the teaching of science is not only for school students, but for the general public as well. These 10 pages are well worth the read. Yes, I know this is from a time when we had just sent a man to the moon with a computer what had a whopping 8K of memory (or something like that), so you are allowed to ask "how relative can it be," but this article is as practical today as it was 45 years ago. Well worth the read.

Charles Barbely writes about "The Spacearium," a new planetarium for the Smithsonian Institution.

There is more, but I do need to save some for the December issue. ☆



## Three new Geodesium albums released

As they have been doing for the past 42 years, Loch Ness Productions is releasing the latest Geodesium albums of planetarium space music to the world. This time around, there are three: Geodesium "Stellar Collections 2," "Infinite Light," and "Startalk."

Mark C. Petersen has brought together these thematic collections from soundtracks that have delighted planetarium-going audiences around the world. "These new albums continue the tradition of featuring music created for the rarefied atmosphere of the dome," said Mark. "The music may have originally been composed for planetarium show soundtracks, but now each piece stands alone as an aural vehicle taking a wider audience across the universe."

"Stellar Collections 2" takes the ultimate deep dive into the Geodesium space music archive. Long-time listeners may recognize some familiar themes in this retrospective album stretching back to 1977. The music enhanced the Loch Ness Productions shows *Light Years from Andromeda* (1980 and 1997 versions), *Saturn: Before Voyager and After* (1981), *Hubble: Report from Orbit* (1991), and *MAGELLAN: Report from Venus* (1992). Other pieces come from custom soundtracks for shows created for the Fiske, Gates, and McDonnell planetariums.

"Infinite Light" features four extended, ambient soundscapes: chill, floating aural journeys of celestial exploration. Originally composed in the 1980s, this music perfectly captures the stillness and utter alien feel of interstellar travel.

"Startalk" salutes the generations of planetarium attendees who learned stars and constellations while listening to Geodesium space music. Composed to enhance the soundtracks of *More Than Meets The Eye* (1987 and 1993 versions) for Loch Ness Productions; *Chronotiscity* (1987), *Alien Whispers* (1988) and *The Great Star Detective* (1989) for McDonnell Planetarium; and *Sky Quest* (1996) for the Albert Einstein Planetarium, these are the sounds that define the genre of planetarium space music.

These three albums are now available for purchase in compact disc form directly from Loch Ness Productions, as well as CD Baby and Amazon. Digital downloads can be found at Apple Music, Google Play, and other online sources. You can also tune in on your favorite streaming services: Spotify, Pandora, Amazon Unlimited, YouTube Music and more.

For more information, visit the Geodesium pages on the Loch Ness Productions website at <https://www.geodesium.com>

## Bowen announces conference scholarship

Bowen Technovation announces that Ian Grey, a physics major at the University of Texas at Dallas, was the winner of the WAC Scholarship. He was nominated by SWAP member Cheyenne Suffka, planetarium and public programs manager, Frontiers of Flight Museum.

Mark Trotter presented the check during the WAC Conference in Omaha, Nebraska. This year the award was presented in memory of Dale Etheridge, retired director of the College of Southern Nevada Planetarium, who passed away in April.

## Successful IYL2015 kit available again

The National Optical Astronomy Observatory's successful IYL2015 Quality Lighting Teaching Kit has been given renewed life, released as *Turn on the Night*, a comprehensive project-based learning STEM kit that explores the impact of human created lighting on the environment.

The kit is now now commercially available world-wide via Laser Classroom, LLC.

The kit was developed by NOAO with grants from the International Astronomical Union and The Optical Society for the cornerstone theme "Cosmic Light" of UNESCO's International Year of Light in 2015 to raise awareness of light pollution,

During that year, NOAO, via partner organizations, distributed the QLT Kit to more than 100 organizations in 32 countries. Seeking to extend the impact of the project, and reach a broad audience of educators worldwide, kit developers reached out to Laser Classroom to collaborate on making the kit commercially available.

*Turn on the Night* is based on, and grounded in the pedagogy and intent, of the original QLT Kit: to educate

middle and high school level students about the environmental impact of human-created lighting.

The kit consists of materials and a comprehensive curriculum guide. It contains problem-based challenges addressing sky glow, glare, and light trespass, and a capstone challenge about energy consumption and carbon footprint.

Laser Classroom, LLC (<https://laserclassroom.com/>) is a small, woman-owned business committed to "Bringing STEM to Light" with educational kits and curriculum around light, lasers, and optics for the K-12 classroom. More information is available from Colette DeHarpporte at [Colette@laserclassroom.com](mailto:Colette@laserclassroom.com).

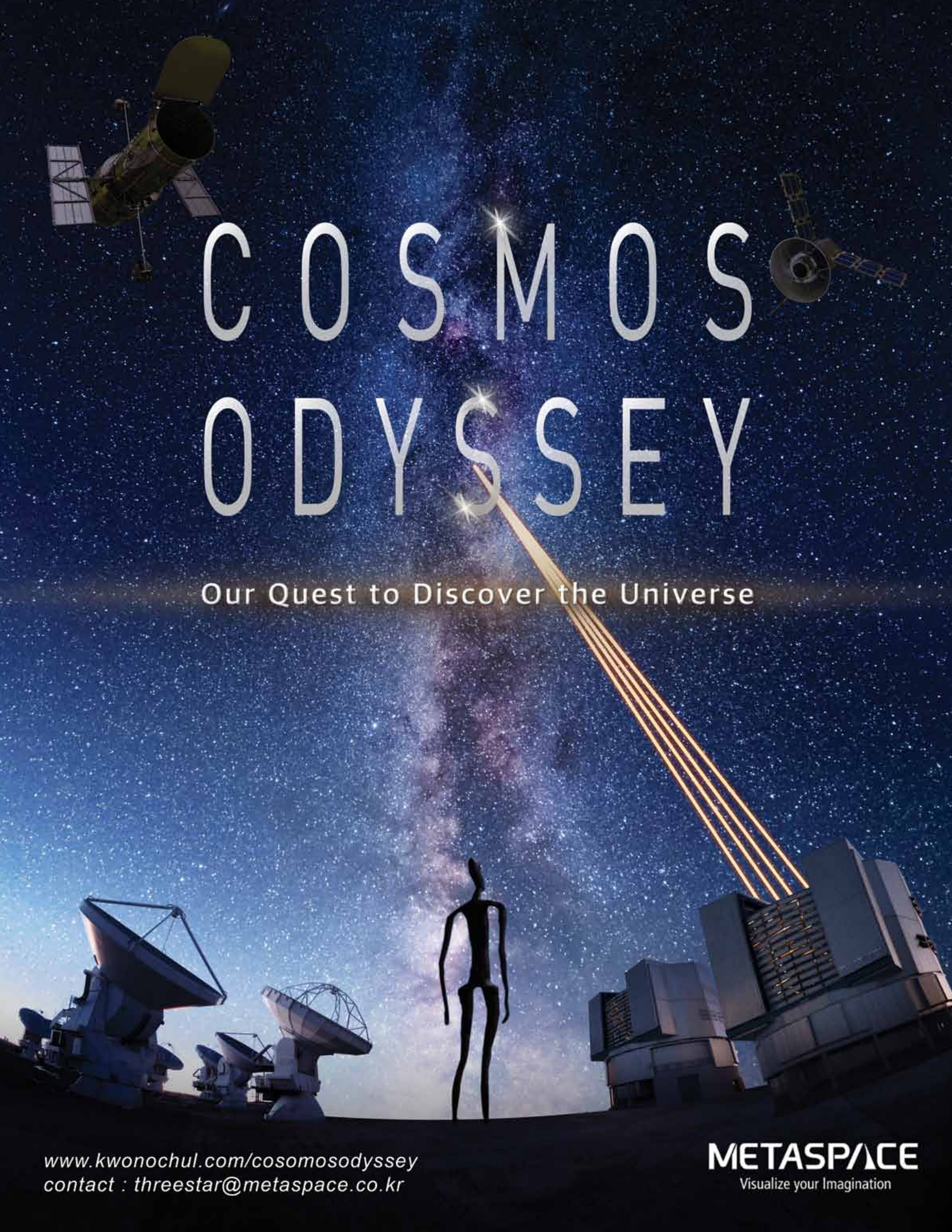
## New book about Napoleon's comet

*Napoleon et la comète impériale* (*Napoleon and the Imperial Comet*) is the newest book released by Jean-Michel Faidit, mathematician and doctor of the history of astronomy based in Saint-Chartes, France.

In 1811, Napoleon is at the height of his glory. From the Napoleonic Code to the prefects, from the baccalaureat to the franc, he has created a modern France. His empire spread over a large part of Europe. It was during this year that Flaugergues de covers Viviers (Ardeche) discovers one of the most spectacular comets of history. Sensitive to the political atmosphere, he calls it the "Imperial Comet."

Napoleon sees a connection with Egypt based on the comet's orbital period of 3095 years (its previous passage by Earth dating to the time of  
(Continues on page 82)



The background of the poster is a deep blue night sky filled with stars and the Milky Way galaxy. In the upper left, a satellite with a large dish antenna is shown. In the upper right, another satellite is visible. A bright, multi-colored beam of light, resembling a comet or a laser, streaks diagonally across the sky from the bottom right towards the center. At the bottom, there are silhouettes of several large radio telescope dishes on the left and a tall, slender, dark silhouette of a person standing in the center. To the right of the person, there are silhouettes of modern, multi-story buildings. The title 'COSMOS ODYSSEY' is written in large, white, sans-serif capital letters across the middle of the image.

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Dr. Ludwig Meier (right) with Neil deGrasse Tyson, director of the New York American Museum of Natural History's Hayden Planetarium, at the final factory inspection of the ZEISS UNIVERSARIUM Mark IX in 1999. Courtesy ZEISS

## Dr. Ludwig Meier, ZEISS' father of modern projection planetariums

Dr. Ludwig Meier, who is considered the father of ZEISS' modern projection planetariums, died on 27 June 2019 at the age of 85.

Meier studied mathematics in Leipzig and obtained his doctorate in 1968. He joined ZEISS Jena in 1958 and worked in the R&D department of the Astronomical Instruments Division right up to the end of his career in 1998. As well as taking on numerous responsibilities in the field of astronomical observation instruments, he was also engaged in fundamental R&D work in the field of projection planetariums. This led to innovative solutions such as algorithms for production processes, adjustments to the drive systems for planet, star field, constellation and didactic projectors, and advances in projector automation and operation. Meier made key contributions to the development of automatic control systems in their transition from purely mechanical analog systems and punched tape to full digital control systems.

He was heavily involved in the creation of the Spaceflight Planetari-

um—the first ZEISS planetarium system for medium-sized domes—and the large-dome COSMORAMA planetarium projectors. Thanks to his activities as a lecturer at the Jena Zeiss Planetarium between 1962 and 1985, he became familiar with the pros and cons of all the various ways of operating a planetarium projector. This led to the development of a new operating concept that continues to play a fundamental role in ZEISS planetarium control systems even today.

In the mid-1980s, Meier was the leading scientist in developing the fiber optic projector, thereby laying the foundations for a technical breakthrough in planetarium technology. Faced with the challenge of how to substantially increase the brightness of the projected stars without using a higher power lamp, the team came up with the concept of conducting light directly and separately to each individual star hole in the star field mask using optical fibers.

Transforming this idea into a finished fiber optic projector took years of intensive development work, the most challenging aspect of which lay in the manufacturing technology. But the final results were well worth the effort: the new system not only boasted a hundred-fold increase in efficiency, it also made ZEISS planetarium projectors into a leading light in the industry.

In addition to his development work, Ludwig Meier also provided advice and on-site support to customers and service engineers all over the world. He is fondly remembered by users in the planetarium community, many of whom benefited from his professional advice on the handover of newly installed planetariums and his invaluable assistance in preparing the outlines of inaugural shows. His many and varied activities in the fields of planetarium development and applications have formed the subject of numerous publications. In 1992 Meier published his book *Der Himmel auf Erden (Heaven on Earth)*, in which the planetarium expert provided fascinating and immensely valuable insights into the history of planetariums.

Dr. Ludwig Meier received the Technology and Innovation Award of the International Planetarium Society in 2014. It pays tribute to the exceptional achievements of an outstanding planetarium expert who has played a key role in the development of modern planetarium technologies at ZEISS.

His colleagues and many planetarians all over the world will always remember Dr. Ludwig Meier with his friendly, helpful and open nature.

☆

—Zeiss

## Waxing New, continued from page 80)

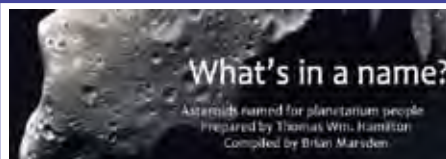
Ramses II) and interprets it as a celestial signal of invincibility.

Napoleon's double personality has intrigued psychologists. The influence of this comet could help to understand the reversal that is occurring with the Russian campaign, and it was in the summer of 1812 that the turning point of the Empire began. Waterloo and the exile follow.

Cited by many writers of the romantic era, this "Comete de Napoleon" left its mark on arts and culture. It is associated with the wonderful harvest of 1811 and the famous "Vin de la comete."

The book, released on 15 July 2019, is available through Les Presses du Midi (<https://lespressesdumidi.fr/>).

☆



(5847) Wakiya = 1989 YB

Discovered 1989 December 18 by K. Endate and K. Watanabe at Kitami. Named in honor of Nanayo Wakiya (b. 1953), who joined the Japan Planetarium Laboratory in 1985 with the space artist Numazawa, after working for the Mito and Niigata planetaria. Among her many activities she writes articles for astronomical magazines and directs programs about space on television.

(5850) Masaharu = 1990 XM

Discovered 1990 December 8 by K. Endate and K. Watanabe at Kitami. Named in honor of Masaharu Suzuki (b. 1949), who is in charge of the Planetarium Programs Production Division at the Gotoh Optical Laboratory. He is also known for his production of 70-mm large-format films.

(5875) Kuga = 1989 XO

Discovered 1989 December 5 by K. Endate and K. Watanabe at Kitami. Named in honor of Naoto Kuga (b. 1964), who produces planetarium programs at the Gotoh Optical Laboratory.

(5975) Otakemayumi = 1992 SG

Discovered 1992 Sept. 21 by K. Endate and K. Watanabe at Kitami. Named in honor of Mayumi Otake (b. 1967), well known for her work as sound producer of planetarium programs.

(6884) Takeshisato = 9521 P-L

Discovered 1960 October 17 by C. J. van Houten and I. van Houten-Groeneveld on Palomar Schmidt plates taken by T. Gehrels. Named in honor of Takeshi (Ken) Sato, a devoted educator and director of the planetarium at Hiroshima's Children's Museum. He is an amateur planetary observer who served as director of the Jupiter-Saturn Section of the Oriental Astronomical Association during 1960-1971. He initiated the ordinance to minimize light pollution in the town of Bisei, Okayama Prefecture. Enacted in 1989, this ordinance was the first of its kind in Japan.

## 2019 - International Year of the Periodic Table

- 1-7 September. ICOM 2019, 25th General Conference, Museum as Cultural Hubs: the Future of Tradition, International Council of Museums, Kyoto, Japan. [www.icom.museum/events/general-conference/icom-kyoto-2019](http://www.icom.museum/events/general-conference/icom-kyoto-2019)
- 6-8 September. NPA meeting, Nordic and Baltic Planetarium Association, Vitenfabrikken, Sandnes, Norway. Conference language is English. Contact: Sven Gundersen, [Sven.Gundersen@jaermuseet.no](mailto:Sven.Gundersen@jaermuseet.no); NPA president Aase Roland Jacobsen, [aase.jacobsen@si.au.dk](mailto:aase.jacobsen@si.au.dk). [www.jaermuseet.no/vitenfabrikken/en](http://www.jaermuseet.no/vitenfabrikken/en) [www.facebook.com/Nordicplanetariumassociation](https://www.facebook.com/Nordicplanetariumassociation)
- 9-14 September. DUG 2019, Digistar Users Group Conference, Boonshoft Museum of Discovery, Dayton, Ohio, USA. <https://dug2019.planningpod.com>.
- 21-24 September. Association of Science-Technology Centers (ASTC), 2019 Annual Conference, Ontario Science Center, Toronto, Ontario, Canada. [www.astc.org](http://www.astc.org)
- 27-28 September. British Association of Planetaria (BAP), 2019 Conference, International Centre for Life, Newcastle, United Kingdom. Contact Lee Pullen@wethecurious.org; [www.planetaria.org.uk](http://www.planetaria.org.uk); [www.life.org.uk](http://www.life.org.uk)
- 30 September-4 October. Brazilian Planetarium Association Meeting, Porto Alegre and Bagé. <http://planetarios.org.br/encontros/xxiv-encontro-da-abp/>
- 4-10 October, World Space Week. [www.worldspaceweek.org/calendar](http://www.worldspaceweek.org/calendar)
- 5 October. Astronomy Day, [www.astroleague.org](http://www.astroleague.org)
- 18-20 October. Data to Dome workshop, organized by the Ho Tung Visualization Lab at Colgate University, the University of Cape Town and Iziko Planetarium Research Consortium, and the International Planetarium Society will be held at Colgate University, Hamilton, New York. This workshop will bring together planetarium professionals, faculty from multiple disciplines, and visualization experts to collaborate on big data for the immersive visualization setting of the planetarium. For more information visit <http://www.datatodomecolgate.org/>
- 23-26 October, Great Lakes Planetarium Association Conference, Toledo, Ohio, USA. <https://glpa.org/conference>
- November 6-9. First Pilikula International Full-Dome Film Festival and Planetarium Conference. Swami Vivekananda Planetarium, Pilikula Regional Science Centre, Moodushedde, Vamanjoor Post, Mangaluru, Karnataka, India. The focal theme for the conference is "Trends in Planetarium Technology." Contact: Dr. K V Rao, director, Pilikula Regional Science Centre, [prscmangalore@gmail.com](mailto:prscmangalore@gmail.com); [www.pilikularsc.com](http://www.pilikularsc.com)
- 12-15 November 2019. International Astronomical Union, IAUS358, Astronomy for Equity, Diversity and Inclusion. A roadmap to action within the framework of the IAU 100th anniversary. <https://iau-oao.nao.ac.jp/iaus358/>
- 13-15 December. CPPN2019A, Workshop & Conference of small mobile digital planetariums, Paléospace de Villers-sur-Mer, France. [http://www.lss-planetariums.info/index.php?lang=fr&menu=life\\_with&page=formations](http://www.lss-planetariums.info/index.php?lang=fr&menu=life_with&page=formations). Info: [lionel.ruiz@live.fr](mailto:lionel.ruiz@live.fr)
- 20-22 December 2019. CPPN2019B, Workshop & Conference of small mobile digital planetariums, Marseille Planetarium, France. [http://www.lss-planetariums.info/index.php?lang=fr&menu=life\\_with&page=formations](http://www.lss-planetariums.info/index.php?lang=fr&menu=life_with&page=formations). Info: [lionel.ruiz@live.fr](mailto:lionel.ruiz@live.fr)

31 December. Deadline for the contest "A week in United States." For information and application requirements go to: [www.ips-planetarium.org/page/WeekinUS](http://www.ips-planetarium.org/page/WeekinUS)

31 December. Deadline of the prize "Page of stars". Contact: Susan Reynolds Button, [sbuttonq2c@gmail.com](mailto:sbuttonq2c@gmail.com) [www.ips-planetarium.org/page/pagesofstars](http://www.ips-planetarium.org/page/pagesofstars)

## 2020 - International Year of Plant Health

- 8 March. International Day of Planetariums, public initiatives between 7 and 8 March. <https://www.ips-planetarium.org/page/IDP>
- 26 March. Deadline of PlanIt Prize for an original video production, organized each year by Italian Association of Planetaria (PlanIt), Italy. The prize is open to everyone. First prize 500 euro. [www.planetari.org](http://www.planetari.org)
- 25-27 April 2020. Gesellschaft Deutschsprachiger Planetarien e.V. (GDP), Annual Meeting of the German-speaking Planetaria, Solingen Planetarium, Germany. [www.gdp-planetarium.org](http://www.gdp-planetarium.org)
- 18 May. International Museums Day, <http://icom.museum>
- 11-13 June. European Network Science Centres & Museums (ECSITE), 2020 Annual Conference, Kersnikova Institute, Ljubljana, Slovenia. [www.ecsite.eu](http://www.ecsite.eu)
- 18-19 June. IPS Fulldome Festival, Edmonton, Alberta, Canada.
- 20 June. Immersive Media Entertainment, Research, Science & Arts (IMERSA) 1 day pre-IPS 2020 event at the TELUS World of Science - Edmonton, see IPS 2020 website for details at <https://www.ips-planetarium.org/page/IPS2020-Program>
- 20-21 June. International Planetarium Society Council Meeting, Edmonton, Alberta, Canada.
- 21 June. Live Interactive Planetarium Symposium - LIPS 1 day event prior to IPS 2020 at the TELUS World of Science - Edmonton. See IPS 2020 website for details <https://www.ips-planetarium.org/page/IPS2020-Program>
- 21-25 June. 25th International Planetarium Society Conference, Telus World of Science, Edmonton, Alberta, Canada. [www.ips-planetarium.org](http://www.ips-planetarium.org), [www.ips2020.twose.ca](http://www.ips2020.twose.ca)
- 21 - 25 September CAP 2020, Communicating astronomy with the public, Sydney, Australia. <https://www.facebook.com/CAPconference/>
- 17-20 October. Association of Science-Technology Centers (ASTC), 2020 Annual Conference, Carnegie Science Center, Pittsburgh, Pennsylvania, USA. [www.astc.org](http://www.astc.org)
- 21-24 October, Great Lakes Planetarium Association Conference, Kalamazoo, Michigan. [www.glpa.org](http://www.glpa.org).

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 are included in the International News column in this issue. The most up-to-date information also is available online in the IPS Calendar of Events at [www.ips-planetarium.org](http://www.ips-planetarium.org)



April S. Whitt  
Fernbank Science Center  
156 Heaton Park Drive NE  
Atlanta, Georgia 30307 USA  
april.whitt@fernbank.edu



## A very special speaker: Captain Ed Dwight

20 July 2019 marked the 50<sup>th</sup> anniversary of the Apollo 11 moon landing. For a few brief hours, humans walked on the surface of our natural satellite, collecting lunar samples, sending images (the old-fashioned way) back to Earth, and thrilling people all over the planet.



Captain Ed Dwight was guest speaker at Fernbank Science Center in Atlanta, Georgia, for the 50th anniversary celebration of the Apollo 11 moon landing. He's now a sculptor, with major works all over the United States. Photo by Fernbank Science Center. Inset, Dwight as a young test pilot. Wikimedia, public domain.

Lots of us held events to celebrate the anniversary. Here at Fernbank Science Center, we were fortunate to have Captain Edward Dwight, the first African-Ameri-

can to enter the Air Force training program from which NASA selected astronauts, as our guest. His stories of the training and politics and the exciting times were pure gold for our visitors.

He described the selection process with the phrase "my card fell out," and it suddenly occurred to me that many of the people in our audience didn't know what that meant, having been born long after punch cards were history.

After his planetarium presentation, he offered to answer questions, and a crowd followed him up to the library space. Captain Dwight is elderly, with a soft voice, but the entire room was silent as visitors listened. Young families with children, older folks who'd watched the moon walk on television, and everyone in between were mesmerized by his words. In a world where many of us seem to be walking around with heads bowed to hand-held screens, seeing everyone entranced by a story teller was a real joy.

## A shout out to Robeson Planetarium

And a shout-out to another 50<sup>th</sup> anniversary: Robeson Planetarium and Science Center in Lumberton, North Carolina celebrates the gold this year as well. The planetarium was started by one of IPS' founding fathers, James Hooks, in 1969, and has had a rough few years lately. Hurricane Matthew destroyed the Center in 2007, and Hurricane Florence added injury to insult in 2018.

As part of the local school system, the planetarium continues with portable equipment in schools and at events. Plans are to rebuild, but finding a site and funding are a challenge. Here's link to a story from their local paper: <https://www.robsonian.com/features/121513/july-has-two-golden-anniversaries-related-to-planetarium>

## Council in Iceland

IPS Council met in Iceland during the June solstice this year. It included reports from past and future conferences, and discussion of the need for clear guidelines on diversity and inclusion for all our members.

Gracious Toulouse host Marc Moutin was digitally present, giving his report electronically. Shawn Laatsch helpfully carried his laptop around the room so each of us could greet image-Marc on screen.

Marc reported that generous financial support from the APLF (Association of French Speaking Planetariums) accounted for almost a third of conference income. The budget was a scary part of the meeting, he said.

He shared comments from delegates' completed evaluations, including "Less French and more English, please" which, he noted, should not be a problem for IPS 2020 in Edmonton, Alberta, Canada.

2020 host Alan Nursall mentioned that Toulouse was a hard act to follow, but "we'll give you lots of English. We have more trees and less ocean. We have some really shallow lakes." Marc Moutin had called the budget "frightening," Alan said. "And that's a good adjective."

He's also promised axe-throwing, poutine, maple taffy, and Tim Horton's coffee.

## The joint MAPS/SEPA conference

The Middle Atlantic Planetarium Association (MAPS) and the Southeastern Planetarium Association (SEPA) met in joint conference in early June, at the State Museum of South Carolina in Columbia. Conference host was the incredible Liz Klimek, ably assisted by the legendary Jack Dunn. Delegate presentations included several about lasers, and they arranged for retired astronaut Clay Anderson to deliver the Margaret Noble banquet address.

Ken Moore shared images and stories of the laser set-up at his home. His apartment overflows with laser equipment. "I got those speakers on eBay for fifty bucks...and \$3,000 for the projector...everyone loves being here. It's like Dave and Buster's at my house."

The next image was of his hotel room, full of equipment "because I have to take everything with me," to which James Albury called out, "Intervention!"

Jon Bell shared his latest book, *An Astronomer's Book of Days (and Nights!)*. He said that his 12<sup>th</sup> grade English teacher, Mrs. Drushell, was known by students as Gravel Gertie for her speaking voice. Her confidence in his writing ability was not great. About the book, he said, "If she weren't already dead, this would kill her."

Clay Anderson shared lots of images taken during his time on the International Space Station. He ran a "Jeopardy" type game with them, inviting people to raise their hands before shouting out an answer in the form of a question. Shouting before being recognized resulted in a \$5,000 penalty, he said.

As the images came up on the screen, various numbers of hands were raised, answers called, and vast sums of imaginary money changed hands. Until the image of St. Louis came up. Dead silence. Then a few tentative hands, guesses of "London?" and "The Thames?"

An image of petal-shaped marinas appeared. Hands shot up everywhere. "Oh, great," Anderson quipped. No one recognizes St. Louis, but you all know Dubai! ☆

April Whitt is an astronomy instructor at Fernbank Science Center in Atlanta, Georgia, USA. She shares that she is so old that she has flown on both the Kuiper Airborne Observatory (KAO) in 1995 and the Stratospheric Observatory for Infrared Astronomy (SOFIA) in 2015.

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\* The above image of Megastar-Neo shows its relative size compared to MEGASTAR-IIA (right in the background), MEGASTAR-III (left in the background) and the soccer ball.

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