

# Southern Skies

Volume 38, Number 4    Journal of the Southeastern Planetarium Association    Fall 2018



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Mel Blake  
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Well, at long last, the fall issue is in your electronic hands. I was delayed with this issue but hopefully you will enjoy it. We have the usual excellent book report, IPS news and the great article about indian mounds from Woodrow Grizzle. We also have reports from most of our member states, and in particular, Adam Thanz sent a collection of photos from SEPA 2018. I could not include them all, but I tried to sample enough to give you the flavor of the meeting, for those of us who could not make the trip to Memphis. From everything I have heard about it, it was an excellent meeting, and everyone learned a lot and had a great time doing so. I wanted to be there, but duties with a summer STEM camp prevented me from attending. I miss you all, so I am definitely trying to schedule things better next summer in order to do both. We will see. Lots can happen between January and June!

In the meantime, I have made contact with a group that indexes journals, and they tell me that we need to be publishing for at least three years consecutively in order to be indexed, so we have one more year to

go, since we missed some issues a few years back.

We are also still working on trying to get all back-issues scanned an on-line. I have a student helping me with this and the first batch are almost ready to be posted.

This issue marks a changing of the guard as well. Bob Hayward, who I am sure is known to a lot of you, is stepping down as the contact for North Carolina. Bob mentored me at PARI, and is one of the best people with which I have worked. He is stepping down from his Southern Skies duties and taking over from him will be Neil Pifer of Horizons Unlimited. I look forward to working with him and continuing the tradition of regular reports from my old stomping grounds in North Carolina. Neil has big shoes to fill, but I am sure he will do a great job. Welcome aboard!

I do want to try to guilt trip our states that have not been contributing regular reports, and to encourage people to send in articles. I have been looking over the older issues from the 1990's and they were rich in articles giving advice and describing what would now be called "hacks" for doing planetarium shows.

Best wishes for the new year arriving soon.

Mel Blake

### Submit your Articles!

Do you have a great activity to engage your audiences? Have you devised a cool gadget or do-it-yourself upgrade that you would like to share? SEPA would love to hear about it and share your knowledge.

We can receive electronic files in most any format. Graphics can be received electronically or in hard-copy, including slides or photos, and will be converted to digital with sufficient resolution.

Submission deadlines: Jan 1 (Winter), April 1 (Spring), July 1 (Summer), Oct 1 (Fall).

# IPS REPORT

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A year-long Centennial celebration of the world's first modern planetarium projector will take place in 2023. The effort is being chaired by Bjorn Voss, director of the LWL-Planetarium in Munster, Germany. Voss has gathered a committee of planetariums worldwide to help plan and implement events that will cross borders, affiliates and dome size. Voss is soliciting feedback on a digital canvas, furnished courtesy of centennial committee member Ryan Wyatt at [padlet.com/ryanwyatt/planetarium\\_centennial](http://padlet.com/ryanwyatt/planetarium_centennial). Please post your comments and suggestions while there is still time.

## IPS 2020

The Tellus World of Science in Edmonton, Canada will host the 25th IPS Conference, June 18 to June 25, 2020. A tremendous amount of planning went into their invitation which was the successful culmination of prior efforts to gain the conference. For conference details, sign up for the IPS 2020 e-newsletter at [IPS.twose.ca](http://IPS.twose.ca)

## IPS 2022

Invitations for the 2022 IPS conference site were presented to IPS Council in Toulouse. Two invitations were received:

Houston, TX  
Space City.  
Proposed dates are July 3 – 9.

Saint Petersburg, Russia  
ART Technology Ltd.  
Proposed dates are August 7 – 11.

The 2022 conference site will be chosen by a vote of IPS Council at the 2019, off-year council meeting to be held in Iceland on June 22 and 23. Additional details for IPS 2022 will be furnished in future editions of Southern Skies.

## IPS Vision 2020

Radical changes to the structure of IPS will be phased in over a 2-year period beginning this year. IPS Council representatives will still be part of the overall structure but will report to regional representatives, who in turn will report to IPS. This will reduce the number of voting delegates from 23 to 8.

Issue 47, No 3 of the Planetarian contains detailed information about the impending changes mandated by the IPS Council who met earlier this year in Toulouse. The on-line edition of the Planetarian also contains the information.

I encourage you to visit the IPS Website for more information about IPS and its many initiatives; [www.ips-planetarium.org](http://www.ips-planetarium.org).

You can obtain IPS membership forms from IPS Treasurer Ann Bragg at [ann.bragg@marietta.edu](mailto:ann.bragg@marietta.edu), myself at [johnhare@earthlink.net](mailto:johnhare@earthlink.net), or at the IPS Website, [www.ips-planetarium.org](http://www.ips-planetarium.org)



# BOOKENDS

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Book Review: Asteroid Hunters by Robin Byrne

About three years ago, Carrie Nugent was one of the guest speakers at StarFest. She generously sent a copy of her new book to Adam and me when it was published. I'm glad she did.

Asteroid Hunters is definitely geared to the novice, but anyone with an interest in astronomy will enjoy it. The book begins with basic information about asteroids, such as their definition and where they are found. This led to the topic of near Earth asteroids and what makes them of particular interest. That segued into impacts on Earth by asteroids, beginning with the woman in Alabama who was struck by a meteorite all the way up to the impact that wiped out the dinosaurs.

Next, Nugent discussed the process of hunting for asteroids. She began by listing the rules of asteroid hunting. This was the one place where I found fault. When you start a sentence with, "The first rule of asteroid hunting is ..." you should end it with "... you don't talk about asteroid hunting." Instead, the rule was to not look at the Sun. Granted, not looking at the Sun is important, but that could have been rule #2. Her next important rule was to share your observations with others. The reasons for this included the important role others play in confirming your discovery and being able to observe from other locations when you can't. These rules will reappear throughout the book when discussing various discoveries.

Once we learned the rules for hunting, Nugent discussed how asteroids have been discovered over the years. In the earliest days, it was by observing a patch of sky, drawing the stars you saw, and then going back a few days later to see if anything had changed. When Giuseppe Piazzi discovered the first asteroid, Ceres, he had great difficulty calculating the orbit, so he waited to share his discovery, wanting the orbit to be



calculated first. The problem was, orbits close to perfect circles are relatively easy to compute from a few observations, but Ceres' orbit is more elongated, so the technique Piazzi was using wouldn't work. Once Piazzi decided to share his discovery, even without the orbit, the importance of sharing was reinforced. Hearing of the orbit problem, the mathematician Carl Friedrich Gauss decided to work on it. Not only did Gauss solve it, but he invented a new mathematical technique to do it: Fast Fourier Transforms.

With the rise of photography, the discovery of asteroids improved. Using essentially the same technique as before, photos were taken of the same part of the sky from a few days, to as little as a few hours, apart. The two images would be stacked in a stereo microscope. If something moved, it would create a 3D effect with the moving object appearing to float above or below the star images.

Today, CCD's and computers do the work. Many programs, including NEAT, Catalina Sky Survey, Pan-STARRS, LINEAR, and NEOWISE perform automated searches. In this case, images are taken of the sky with a span of time between images of the

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same section of sky. Then the computer analyzes the images. If it finds something that has changed, the images are sent to the scientists, who inspect the images individually. The human factor is needed since there are several things that could appear to behave like an asteroid, such as internal noise or cosmic rays.

Nugent shared her experiences working with NEO-WISE. In one episode, a candidate was discovered by the computer. She and her colleagues inspected it. It was, indeed, a real asteroid. As they calculated the orbit, they first thought it was going to collide with Earth. After more observations, they found that it wasn't going to collide, but would come very close. With the advanced warning their program provided, it was possible to use radio telescopes to bounce radar off of the asteroid as it flew by, creating a surface map of the asteroid.

The potential of an asteroid impacting Earth was the final section of Nugent's book. For a very long time, most policy makers thought of asteroid impacts as something that happened in the distant past, not something to worry about. A couple things helped bring it to the attention of people outside of the sciences. The first was the impact of Comet Shoemaker-Levy with Jupiter. Suddenly we see that things still do crash into planets. The less scientific influence, but influence none-the-less, was the release of two films: Armageddon and Deep Impact. Suddenly the threat of an impact was on people's minds.

So, what do we do if there's an asteroid on a collision course with Earth? Nugent discussed different possibilities. The goal is to slightly nudge the asteroid long before the predicted impact. If the course is changed early enough, only a small deviation would be sufficient to avoid hitting Earth. But how do you nudge an asteroid? You could send a spacecraft to slam into it, but the spacecraft would need to be either very large, or moving very fast to have much of an effect. Instead of a spacecraft, we could explode a nuclear bomb near the asteroid, using the expelled radiation to provide the needed push. Another possibility is to put a spacecraft in orbit around the asteroid and use its gravity to slightly change the asteroid's trajectory. The one technique that Nugent clearly didn't have much faith in is the idea of coating one side of the asteroid with a

material that has a different reflectivity than the other side, and use radiation pressure from the Sun to move the asteroid.

In all these scenarios, their effectiveness largely depends upon the structure of the asteroid. Some are solid bodies, but other are described as "rubble piles." Which one it turns out to be is important to know before deciding how to move it. Another problem is if the asteroid is rotating quickly. That will change the amount of effect a push has on its motion, since some of the force will be interacting with the rotation instead of the trajectory. This emphasizes the importance of finding asteroids early so that we have time to study them and learn as much as possible.

Overall, Asteroid Hunters was a very good book and a quick read. Other than the missed opportunity to reference Fight Club, Asteroid Hunters by Carrie Nugent is a great read for either pro's or beginners.

#### References:

Asteroid Hunters by Carrie Nugent; Ted Books Simon and Schuster, 2017





# News From the SEPA Region Fall 2018



## Lafayette Science Museum Lafayette, LA

Dave Hostetter reports: This past summer was the busiest summer in the history of our planetarium with a total attendance beating our previous record by over a thousand people, about a 20% increase. It was so busy that when I reviewed attendance in September I found a notation of 138 people looking through a telescope for a library outreach event in early June, and I don't even remember doing it! More than another 400 looked through our solar telescope during weekly lunchtime sidewalk astronomy in June through August, over 600 attended our 3-day planetarium marathon, and our Planet-Palooza observing night drew another 230. The weekly showing of Magic Tree House: Space Adventure sold out nearly every show and sometimes required an extra overflow showing, something that has never happened to us before. We passed our previous planetarium annual attendance record in mid-September. Now all we must do is figure out what we did right this year, so we can keep on doing it!

Looking into the autumn, we'll have International Observe the Moon Night in October in conjunction with a weekly concert in a park by the Museum. In

addition to telescope observing, we expect to have lunar samples courtesy of the University of Louisiana-Lafayette Physics Department and "lunar-like" Earth rocks from the UL-L School of Geosciences. In the dome we will feature the free ESO programs Mayan Archaeoastronomy: Observers of the Universe for Louisiana Archaeology Month and International Archaeology Day in October, and Phantom of the Universe (about dark matter) in November and December. The Lafayette Science Museum (LSM) will also open its new Discover Store in October.

LSM's 50th anniversary happens in 2019 and plans are being made for several events throughout the year in conjunction with that.

## Irene W. Pennington Planetarium Louisiana Art & Science Museum Baton Rouge, LA

Jay Lamm reports: The Universe Gallery is now home to our new 48" spherical display OmniGlobe. This will offer a wide array of engaging content for both school groups and our public visitors to experience. The educational and entertaining possibilities open our classroom routines to incorporate this new OmniGlobe in fun, new ways. The OmniGlobe also offers real-time weather updates which can be saved and replayed later, e.g., the emergence and landfall of Hurricane Florence.

We celebrated our very first Asteroid Day on June 30 with a host of hands-on activities and special planetarium shows. Guests created their own craters, learned about and took selfies with OSIRIS-REX, and even explored the chemical composition of asteroids with BASF.

We also rolled out our first Shark Week to premiere our large-format film, Jean Michel Cousteau's Secret Ocean. It was a weekend of shark-themed shows in both our planetarium and auditorium theater.

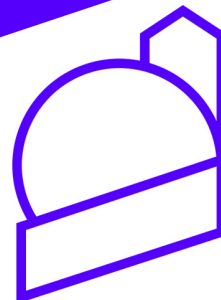
Planetarium production has been upgraded with the addition of full-dome photography and a render farm which is currently in the works. The Nikon D810 is being used for crisp, clear, flicker-free, true 4K time-lapse sequences such as sunsets and sunrises which

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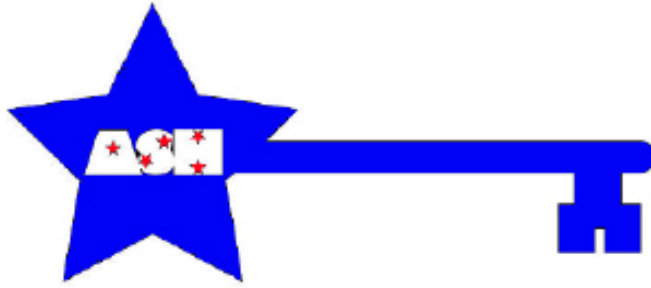
### Paul Campbell Fellowship Award Nomination Form

Nominees must have been a member of SEPA for at least ten years, and they must display qualities in each of five areas, as represented by the five-pointed star shaped award: integrity, friendship, service, knowledge, and vision. Please submit this form to any SEPA Council member.

Nominee's Name: \_\_\_\_\_

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will be incorporated into our in-house Sky Tonight programs. In addition, the Sky Tonight shows will be able to conclude with a nighttime photo illustrating what was previously covered in a recognizable, local setting.

As far as our current planetarium content, we are running and rotating a host of shows, including: *Secrets of Gravity: In The Footsteps of Albert Einstein*, *Dinosaurs Alive!*, *Magic Tree House: Space Mission*, *Lewis & Clark: Great Journey West*, *We Are Stars*, and *Dream Big: Engineering Our World*.

**KENTUCKY**  
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East Kentucky Science Center and Planetarium.  
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Steve Russo reports: This Summer we changed the way we do our Summer camps. We normally do around seven or eight camps, but this year we only did three of them: Racing Robotics, Itty Bitty Nano Science, and Space camp. Over the years we have not allowed adults into the camps, so the main complaint has been from the parents that they couldn't partake in the activities. So this year we tried something new.

"Drop In For Science" camps took place on Wednesday mornings and involved a two hour classroom activity and a planetarium show. But the main thing was that children had to be accompanied with adults. This did two things. First it resolved the previous complaints that adults were not allowed in the camps. Secondly, many of the adults had never been to the Science Center as their kids came with school groups, so now they knew what the Science Center was all about.

During several of the "Drop In For Science" camps, we had guest instructors who were actual scientists in

the fields of Chemistry and Robotics.

Our new camp activities proved to be very successful.



We also had an interesting Super Science Saturday, where the Liberty Nature Center brought over a dozen live "birds of prey". Our exhibit hall was filled with Owls, Falcons, a Bald Eagle, and other assorted birds. The staff of the Nature Center taught the audience about the birds and their rehabilitation.

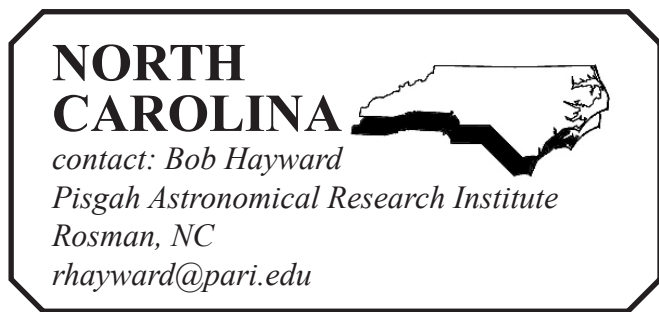


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The EKSC continued to have over a dozen tour groups visit the facility from IN, IL, WI, MI, PA, NY, and other places.

And as I write this, we are gearing up for an upgrade to our planetarium lighting system. More on that next time!

And remember Kentucky Planetariums, please send me your stories about all the things you are doing so I can put it in this column. Send me info at [srusso0002@kctcs.edu](mailto:srusso0002@kctcs.edu).



**The Learning Center at PARI  
Rosman, NC**

**Nonnie Cullipher reports:** This year's season of three Duke TIP Astronomy Field Research intensives was especially exciting and fruitful. Nearly 90 high school students completed their own research projects on a wide variety of topics, including pulsars, exoplanets, nebulae, and more. One group of three students made detailed measurements of expansion rates of the Bubble Nebula and their work has been accepted for publication. Keep an eye out for the article in the National High School Journal of Science as "Expansion Measurement of the Edge Velocity of the Bubble Nebula (NGC 7635)." Our summer research fellows did an additional three projects, two of which were just presented at the North Carolina Astronomers' Meeting.

Other summer activities included workshops for local libraries on Stellar Classification, the Moon, the Sun, and the Planets and a public lecture by Dr. Bob Hayward on local stargazing opportunities which included a an observing opportunity for participants to view the planets with telescopes.

We celebrated the Perseid meteor shower with an all-night event and a full house. We will be providing the same experience in December with the Geminids.

The Learning Center at PARI recently reopened for our Fall Season with an exciting, hands-on presentation of nocturnal animals in partnership with the WNC Nature Center. We're getting ready to hold our second Family Constellation Camp in early November, and have a busy fall full of school field trips, science clubs and scouting groups. The LCAP has been very active with both girl and boy scout groups and is providing many opportunities for scouts to earn a myriad of badges in one day or multi-day programs. The AdventureDome planetarium has been a focal point this season to support constellation studies and planetary science. The planets have been amazing to see this summer.

LCAP recently said goodbye to two excellent scientists, long-standing employees, and dear friends. Christi Whitworth and Ben Goldsmith have moved on to other opportunities and will be missed. We wish them the best.

Stay tuned for our summer camp schedule. We will be offering 8 camps this summer: 3 week-long Astronomy camps for middle school girls, 4 week-long Astronomy camps for boys and a 2-week deep dive Astronomical Research camp for high-schoolers.

**Horizons Unlimited, Margaret C. Woodson Planetarium, Salisbury, NC**

**Neil Pifer reports:** On August 30th and 31st, the Carolinas Association of Planetarium Educators (CAPE) met here and it was a productive and fun two days. One highlight of CAPE 2018 is we had 5 brand new planetarians out of 21 from all over NC and SC join us for professional development. Meeting new professionals always is exciting and that means new ideas and fresh looks at olderspaces. Another highlight was that we also had two star talks using the Spitz A3P in addition to the usual full dome and powerpoint style of presentations. Also, the mayor of Salisbury, Al Heggens, wrapped up our first day sharing how the planetarium was a highlight of her childhood. In the evening, Cauble Creek vineyards hosted dinner and we were blessed with an amazing sunset, great com-

company, and wine.

The second day of the conference, our staff got to share with the delegates what we do here at Horizons Unlimited with K-12 students every day. I think some of the Kindergarten lessons were the most fun! We are excited to be hosted by Katherine Hunt at the Ingram Planetarium in 2019 and very lucky that her planetarium escaped Florence nscathed



*Solving a kindergarten problem of Ormie (a pig) getting cookies*



CAPE 2018

## Robeson Planetarium, Lumberton, NC

Ken Brandt reports: The Robeson Planetarium was subjected to another round of flooding from yet another Hurricane. This time, it was Florence. As I'm writing this, Michael churns in the Gulf of Mexico, en route to a landfall in the Florida panhandle. We stand to get about 6-10 inches of rain we can't absorb and don't need.

When Florence was bearing down on the coast of NC, I rolled the inflatable into my car, and took it home-which sits perched on a bluff. High ground. Believe it or not, pervasive roof leaks across the district and the resulting mold outbreaks have prevented the reopening of our schools-almost a month after the hurricane. So, I am setting up the inflatable in a high, dry space, and doing shows for the day cares, and other institutions that have our kids in this great out-of-school void. Sometime soon schools will resume, and so will our programs.

The Morehead Planetarium will have held a benefit program for the Robeson Planetarium. The outpouring of support from our sister institutions in NC has really been a source of strength.

Of course we're still working hard on trying to get the rebuild going. My community advisory board, Architect Tim Barry from IPS, and the numerous letters of support from many institutions across the USA keep us going. It's a long haul, especially with so many things fouled up in this district, and then more happening courtesy Florence, Michael, and that other storm forming near the Cape Verde islands. You know-the next "500 year flood event" that some people will maintain is perfectly normal.



## SOUTH CAROLINA

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BlueCross BlueShield of South Carolina Planetarium  
South Carolina State Museum  
Columbia, SC

Liz Klimek reports: We had another great summer, filled with astronomy summer camp activities, laser shows, and fulldome music shows. Many thanks to Neil Pifer and his amazing staff at the Margaret C Woodson Planetarium in Salisbury, NC for hosting an excellent CAPE meeting this past August!

On Sept 29th our museum was once again transformed into the 'Museum of Oz' for the month of October. The planetarium brought back Skies Over Oz, a program that we created last year that combined a straight live sky with an imaginary trip to the Land of Oz to hear how Dorothy's story might be told as a sky myth. We'll also be ran a family-friendly Halloween laser show at least once a day throughout the month. This show is a planetarium staff favorite, as we love encouraging the audience to sing along to songs like Purple People Eater and Ghostbusters, and there are lots of fun special effects we've worked into the show. Some of us may have gotten caught dancing around at the console during Monster Mash!

This November the South Carolina State Museum will celebrate its 30th Anniversary with a weekend of extended hours and special programming. While the planetarium is only just over 4 years old, this is an opportunity for the planetarium to show how it has contributed to the museum's growth. We'll be doing extra shows highlighting the variety of experiences that we offer. We'll also be doing a special live program about the planets for museum members, as a way to say thank you for their support.

We have two more planetarium weddings, one in October and one in December. They will be our third



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and fourth weddings, respectively. The next one will be the most creative one we've had yet, featuring a dramatic moonrise, a flight through the stars, and a Millennium Falcon flyover.

In terms of planning we are also looking far ahead, putting together a live program for the lunar eclipse in January, considering ideas for Astronomy Day in May, and collaborating with other museum educators on astronomy activities for new Girl Scout Badge Clinics and upcoming break camps.

Amidst all of this we certainly haven't forgotten about SEPA-MAPS! Save the date: the meeting will be from June 4-8, 2019. Planning continues, and we hope that many of you will be able to join us here in Columbia.

**DuPont Planetarium**  
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**University of South Carolina Aiken**  
**Aiken, SC**

**Gary J. Senn reports:** The DuPont Planetarium at the Ruth Patrick Science Education Center (RPSEC) on the campus of the University of South Carolina Aiken (USCA) was excited to participate in the 2018 annual meeting of the Carolina Association of Planetarium Educators (CAPE). CAPE was held at the Margaret C Woodson Planetarium in Salisbury, NC on August 30-31. As the planetarians arrived on site, they were greeted by Neil Pifer and his amazing staff who wore actual "cap"es" to be in the theme of the group. The staff members had names on their capes that indicated their roles at the planetarium. The conference was well done and provided for great interaction among the planetarians in attendance. We look forward to the next CAPE in 2019 at the Ingram Planetarium in Sunset Beach, NC. Please visit <http://rpsec.usca.edu/Planetarium/CAPE/> for more information.

We are looking forward to the SEPA-MAPS conference, which will be from June 4-8, 2019. It will be at the South Carolina State Museum where Liz Klimek and her staff are preparing to host an amazing conference. Begin to make your plans to attend now!

We are excited about Moon Day in 2019. Yes, we are calling it Moon Day. You might know or know of Jim Mullaney. Jim was the first planetarium director at the DuPont Planetarium. He has been a proponent of establishing Moon Day as an official holiday to celebrate the first moon landing on July 20, 1969. Moon Day is on our brochure, so it must be official! Moon Day is on a Saturday in 2019, so it will be easy to make July 20, 2019 a day for events for the public.

In September, we presented "Sunstruck" by the Michigan Science Center and sponsored by NASA. We have a local "sponsor" for this show. Savannah River Nuclear Solutions (SRNS) operates the facility at the U.S. Department of Energy's Savannah River Site, which is in Aiken County. In our announcement of the sponsorship, we stated, "The Sun operates a nuclear facility at the center of our solar system, and SRNS operates nuclear facilities at the Savannah River Site." We also presented Magic Tree House - Space Mission by the Morehead Planetarium and Science Center.

In October, we held our annual Science Education Enrichment Day. We had over 4,000 people attend South Carolina's Oldest STEM festival, which provided over 70 exhibits for the visitors to see. In the planetarium, visitors viewed Saving the Dark and a short program about the future of NASA Exploration. We also presented our own program, I Spy the Sky where visitors experienced the only known camera obscura that shines on the inside of a planetarium dome. Additionally, we provided a live night program to enable the visitors to keep their eyes on the skies.

In November, we are presenting One World, One Sky: Big Bird's Adventure. And Seven Wonders by Evans & Sutherland.

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Settlemyre Planetarium  
Museum of York County  
Rock Hill, SC

**Carole Holmberg reports:** The Settlemyre Planetarium is currently running “Einstein’s Gravity Playlist.” On October 20 we have a special National Chemistry Week event, using the NISE Network’s “Let’s Do Chemistry” toolkit, focusing on astrochemistry, as the theme this year is “Chemistry is Out of This World.” On October 27 the museum will have its annual Spooky Science Saturday. This year’s theme is “Face Your Fears.” And the planetarium has licensed Morehead Planetarium’s “Jeepers, Creepers” with silhouetted bugs on the dome and hopefully it will be scary for our audience, but not too scary. We are gearing up for this summer’s Apollo II 50th Anniversary, as I am sure many of you also are.



Bentley Planetarium - Tellus Science Museum,  
Cartersville, GA.

**David Dundee reports:** Our new Konica-Minolta Sigma 1.5 has been installed. We are enjoying this new more powerful system. The star field is truly beautiful. We are planning to add more live sky tours and cut back the number of prerecorded movie since we have such a beautiful sky to show off. We premiered for school groups “To Worlds Beyond”, a very nice production about the solar system. This past summer we had so much fun during “Mars Fest” at the end of July. We had several nights of Mars viewing and one day of family activities partially supported through NASA and a “Universe of Learning” grant. Over 1500 guests attended our Mars Fest. One of our activities the “Human Powered Solar System” we have spun off into our 4th and 6th grade “Exploring the Solar System” program. Our registration for student programs continue to come in now topping 35,000 for the school year. Our 10th annual “Night at the Museum”

had yours truly as Galileo (they needed an old man). That event saw about 1,800 guests.

Fernbank Science Center Atlanta, Ga.

**April Whitt reports:** Fernbank Science Center’s been busy through the fall and winter months of 2018.

We’re tracking rising attendance numbers in our planetarium school programs, school and public outreach programs, and general attendance. More wear and tear on the building and staff, and well worth the extra effort. Those efforts continue to attract out-of-county school groups for our planetarium offerings. Scout and home school groups are coming for programming as well.

The state of Georgia adopted new science standards this school year, and we’ve aligned planetarium lessons with that NGSS-based curriculum. Teacher workshops have shared the “obtain, evaluate and communicate” goals for student learning.

We’ve given presentations at NSTA conferences, and at the IPS conference in Toulouse this past July, and developed new outreach programs for schools about light pollution and the solar system.

Dr. Scott Harris and Mark Lancaster assembled several NASA video segments into Fernbank’s fall public program, Journey to Mars. With the red planet so visible, observatory visitors are viewing and asking questions.

The Ralph Buice Memorial Observatory is undergoing a cleaning and organizing effort by several of our awesome volunteers. When the economy tanked, staff were let go. It’s great to see that dome waking up again.

Fernbank continues to support the Astronomers Without Borders eclipse glasses donation program. AWO collects eclipse glasses and distributes them



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Passport to the Universe was developed by the American Museum of Natural History, New York ([amnh.org](https://amnh.org)) in collaboration with the National Aeronautics and Space Administration (NASA). Major support for new version provided by California Academy of Sciences, San Francisco.

*continued from page 19*

in other countries, so more of us can enjoy the spectacle safely. If you're interested in joining that team, information is available at <https://astronomerswith-outborders.org/awb-programs/resource-sharing-programs/eclipse-glasses-donation-program.html>

Special events have included a NASA 50th Anniversary Tribute on September 28 and 29, a fulldome astrobiology special on October 16, Earth Science Week in October, National Chemistry Week's "Chemistry is Out of This World" theme on November 3, and our annual "Upon A Midnight Clear" concert, with stellar composer/performer Jonn Serrie.

Here's wishing everyone a safe and successful holiday season!

**James A. Smith Planetarium, Walker County Schools, Chickamauga, GA**

**John M. Hart reports:** Walker County Schools' Smith Planetarium welcomes Blake Clark as an Intern through the Work Based Learning Program at Ridgeland High School. Enrolled in Advanced Placement courses with dual enrollment, Blake aspires to prepare for a career in Astrophysics. After completion of his education, he dreams of "going to the moon to collect Helium3, refine it, and use it to do research on nuclear fusion". Blake is the oldest of five, plays the trombone, and got his first telescope at age nine. It is no surprise that he likes Star Wars,



Star Trek, Harry Potter books, and has special interest in science programs presented by Neil deGrasse Tyson. Blake is pictured with Planetarium Director John Hart. Georgia Southern Planetarium, Statesboro, Ga.

**Dillon Marcy Reports:** The planetarium has been up to a lot since our last report. We are in the middle of the fall semester with our Pink Floyd: Dark Side of the Moon show just around the corner. It is our most popular show of the semester, and with the response time to reserving our tickets we expect it be completely reserved in a day. We changed our way of reserving tickets to our events to the website Eventbrite. Ever since we switched and no longer rely on email ticket reservations all tickets usually are reserved by the end of the second day. At the end of the semester and right before finals we will be shows Let It Snow to give the students one more chance to procrastinate before they need to study. We will once again be teaming up with Toys for Tots. We will be asking our guests to donate a toy as an optional payment to visit the show.

Three of us recently returned from the Digistar Users Group Conference in Salt Lake City. We got to meet with others who use our system Digistar 5 and the newest system Digistar 6. We got to share ideas of what works best with our system and how to present new and exciting topics use the capabilities of the Digistar system. We got to take a look at the Digistar 6 system and see what it offer if we upgraded. We were also able to see some of the new shows available from E&S as well as shows from other production studios. We toured one of the sets of Mars 1001 after a screening and took a few photos while there. We have a good list of shows we now are looking into based on what we saw, but also on the recommendations of other planetarians.

The planetarium is beginning to expand what it can do outside of the dome with the help of our students and the availability of new resources. Our chapter of Society of Physics Students is providing us with eager students to learn how the planetarium works, but also assist with telescopes during our events. They are starting to build up a collection of activities they can present to the public for their own events but also assist us with our events with activities after the public visits for a show. We are also on the final leg of our Planet walk.

*continued from page 21*

We have scaled the solar system to our campus and have put markers for each of the planets at their correct scaled distance. They are illuminated with LED's at night, and are currently in the process of attaching glass with an appropriate color for the planet. When complete they will also have brass plates attached with information on the planet and a few other engaging things that our visitors can do. That is all for the Georgia Southern University Planetarium. We will be sure to have more to update you

## TENNESSEE

*contact: Adam Thanz*

*Bays Mountain Planetarium*

*Kingsport, TN*

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The Autozone Dome at  
The Sharpe Planetarium  
Memphis, Tennessee  
david.maness@memphistn.gov  
<http://www.memphismuseums.org/>

Dave Maness reports: It looks like I missed a couple of publication deadlines for News from SEPA States in the recent past. I may have a good excuse. I hosted a conference! I hope everyone who attended enjoyed a sincere Memphis welcome. Again I want to thank all of you who helped me make it the best it could be. It is a long list that includes Ricky Evens, Adam Thanz, David Dundee, Derek Demeter and other past conference hosts who offered help and encouragement, also Ken Brandt, Patsy Wilson, John Hare and ASH Enterprises for setting up and operating the Hospitality Suite, Jon Bell for the Constellation Shoot Out, all of the monitors and presenters for talks and workshops, and of course all of the wonderful exhibitors in the conference hotel's Vendor Hall. A big thankyou also goes to Konica Minolta for once again arranging for the setting up and operation of the Show Dome in the hotel lobby.

After we said our "good byes" a small group of us set out on a post conference trip to the Coon Creek fossil site that is operated by the Pink Palace Museum. There we risked poison ivy and other hazards, climbed

down into the creek itself for the chance to find our very own 70 million year old fossils, naturally cleaned by the slow moving water. Here are a few photos.



*The vendor hall.*



*A Didymoceras fossil found during the post conference trip.  
It is about 70 million years old..*



*The stairs leading to the telescope at Rhodes Observatory*



*The show dome.*



*The Planewave telescope at Rhodes Observatory.*



*Collecting fossils.*

*continued from page 22*

Apparently I wasn't too exhausted from the conference to keep me from playing in my regular Sunday night adult league hockey game. So I managed to drag Derek Demeter to the rink and there we see Dave Hostetter who drove down from the hotel. They added two more to the "throng" of fans there to see the Maroon Goons play. By the way, I was traded after the summer season, so I am now a Bruin (not a Bruin). It is called a "Beer League" after all.

I never did take any time off after the conference. Now it seems the summer went by too fast and we are in the upswing for school group attendance. The Holiday season will be upon us before we know it. The "Pink Palace" mansion has been closed for well over a year, in order to increase access (to the third floor) and redesign the exhibits there. It is now expected to open in December.

The planetarium also got some attention. We purchased the new Premium Laser system with effects from Audio Visual Imagineering. Our package included the new midi instruments (drums and guitar). Those of you who attended IPS may have seen the guitar demonstration during the conference in Toulouse. We open our regular Friday night showing on October 5.

In late June or early July former planetarium staff Roy Foppiano and I joined up with the Memphis Astronomical Society for a public observing session at Village Creek State Park, in Arkansas. I remember it well because I lost my phone that night. Apparently I left it on top of my car after transferring telescopes from one vehicle to another. The first clue was hearing an unusual "thump" near the back of my car on the way home. Fortunately it was insured and I was able to find enough of it to send back for replacement.

Currently running in the planetarium is our feature program Two Small Pieces of Glass. The summer feature Phantom of the Universe still has a single daily showing at 4:00 pm. Also showing is Seasonal Stargazing from Loch Ness. Soon we will be in the Christmas Holiday time with the return of Santa's workshop display and the Holiday Festival of Trees. Santa arrives via helicopter to the front lawn on the Saturday before Thanksgiving to begin his pre-Christmas residency at the Pink Palace. This year we will add Laser Holidays to our offerings, which

include the Loch Ness Season of Light. That is about all for now.

Have a happy and prosperous autumn!  
Dave

**Bays Mountain Planetarium, Kingsport, TN**  
**Adam Thanz**

**Astronomy & Space Sciences Program Coordinator**  
**- Planetarium Director**

Adam Thanz reports: Greetings Fellow Planetarians! Our main program is currently "Sunstruck" from the Michigan Science Center. In addition to a live sky tour, we've also added some activities that engage the audience about the Sun. We've also made a small model of the Earth that is to scale to our 40' dome if it was the Sun. This should add to our audience's understanding of some basic principles.

Our alternate programs offered at 2 p.m. on weekend days is currently our live tour of the night sky called "Appalachian Skies - Fall." That will run until the end of October. November sees a return of our adventurous tour of the Solar System, "Planetary Visions."

We are also providing our regular, October-November StarWatch observation program. It is free and held on Saturday nights at dusk. If poor weather, we meet in the planetarium. Our astronomy club, the Bays Mountain Astronomy Club, hosts it and its lots of fun.

As I write this, I am thinking back to June and July of this year and all the travel it included. June saw the wonderful SEPA WAC 2018 conference hosted by the Pink Palace in Memphis, TN with Dave Maness at the helm. There were lots of fun things to do and lots to learn. I still feel that the conference is one of the best parts of our organization. It allows us to meet and share and make that personal connection. We all, essentially, work in the dark. We need to get out, at least once a year, to see the light of the Sun! Thanks, Dave, for all your hard work!

Another part of the conference, for me, was that I took care of the proceedings, so it was great to get that together for future reference. All of those assets have been complete for a while and are awaiting a solution to a Dropbox issue with SEPA's account. The assets

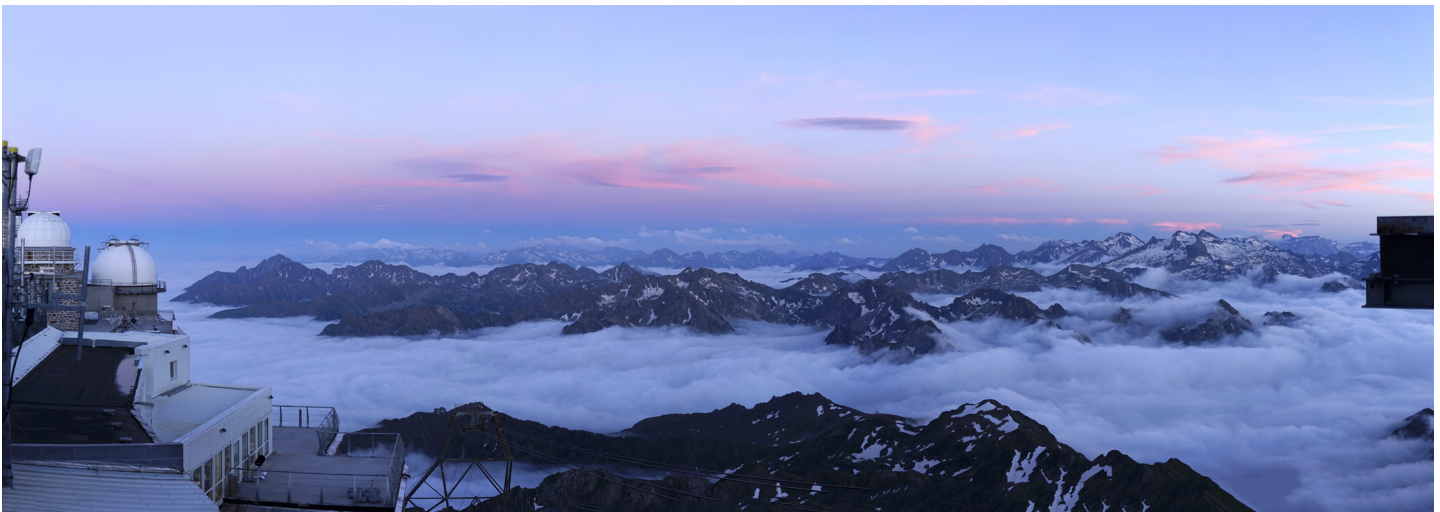


should hopefully be up for all SEPA members to access by the time you read this.

July saw the biennial IPS conference held in Toulouse, France. It, too, was great. Robin & I extended the trip for personal travel and really enjoyed it! I will include a photo that was part of the Paul Dupuy Museum in Toulouse. We had read that it was in Toulouse, but not about what it included. We just happened by and decided to visit. We're glad we did! It included all sorts of orreries, time pieces, and more. The image included here is of an orrery from the early 19th century. It includes all the planets known then (Mercury-Uranus) but also four other planets, Ceres, Pallas, Juno, and Vesta! A number of years later, more of these objects were discovered and these planets became reclassified as minor planets, or asteroids. It seems that the scientific method was applied when new data suggested a change in our understanding of the Solar System. Now if we can only unanimously apply this process to new data continuing to change our understanding of the Solar System! Remember, it's not personal, it's science.

Another memory was from the post-conference tour of Pic du Midi in the French Pyrenees. When Robin & I heard about it two years prior, we were quite excited! We weren't disappointed. Situated at an altitude of almost 10,000 ft., it was another world. We were above the clouds and watching sunset. We toured the facility and were granted access to the largest telescope in Europe. We were able to stay long enough to see the stars come out. The other image included shows the Belt of Venus. It occurs when the Earth is casting a shadow upwards above the horizon line. Notice the sunset reds (the actual Belt of Venus) with darker sky below.

That is all for now. See you in Columbia, SC in 2019!



Above: Pic du Midi Panorama with Belt of Venus. Here's a panorama taken from the observatory at Pic du Midi. It is a little past sunset. We see the Belt of Venus as the twilight glow that is seen all around, and above, the horizon. Image by Adam Thanz



Left: Orrery with Minor Planets. This amazing orrery from the early 19th century is made of brass, wire, and paper! The disks represent the planets. The small ring is the Earth/Moon system. The inclusion of the then eleven planets is most interesting. Image by Adam Thanz.

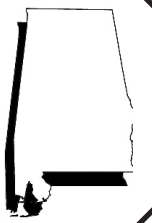
**Sudekum Planetarium, Adventure Science Center,  
Nashville, Tennessee**

**Drew Gilmore reports:** Greetings from Nashville! We would like to start by welcoming our newest part time planetarium educator Thomas Gaudin to our growing crew.

New shows to our lineup: "Explore" started in September, and "Secrets of Gravity" will open in March. We have also added regular montly 'sensory friendly' offerings to our schedule, with the volume just a little lower and the house lights just a little brighter. You can learn more about Adventure Science Center's accesibility initiatives at: <http://www.adventuresci.org/accessibility/>.

Finally: our GOTO Chiron star projector celebrated a tenth birthday earlier this year. We spent a week closed down in September as technicians In san and Enomoto san from GOTO worked with our own techs Marie Christopher and Adam Smith, to give it a thorough check up and cleaning. The results are jaw-dropping: the stars are now as crisp, bright, and plentiful as when Chiron was first installed. If you're in the Nashville area, do stop by and see our stars!

**ALABAMA**  
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UNA Planetarium  
University of North Alabama, Florence, Alabama

**Mel Blake reports:** The late summer is often a slow period for UNA planetarium, with most schools out and classes on hold. However, we continue to show a marked boost in attendance with our regular public nights, which continued over the summer. There was about a 50% boost over attendance from the previous year. This is no doubt due to the left-over awariness from the eclipse last year. We are looking at ways to maintain the attention of the pulblic.

As part of our continuing effort with the Shoals Astronomy Club to renew the observatory at Lagranage Mountain, we succeeded in obtaining a Walmart Community grant to obtain a new telescope for the facility. We selected at 12-inch Meade Lightbridge telescope fo this, due to its ease of use, and the fac that it is intended mainly for visual observing. so an equatorial mount was not necessary. We assem- bled the telescope and columnated, with the assis- tance of my student worker Lauren Wigginton, and Shoals astronomy club members Eric Geater, Rocky Stone, and Mike Worthy. A "First Light" ceremony is planned for November.

One new initiative is that we have started work- ing with the Natchez Trace Parkway Association on a program that will see us discuss American Indian sky lore at the Nathez Trace in the spring/summer of 2019. The concept is to have the planetarium's staff prepare a star chart with some of the American Indian constellations, point them out in the sky, and a local member of the Chickasaw nation will tell the stories. We are working out some legalities about using the park at night and hope to get this going soon.

We are also looking forward to our annual events for Observe the Moon Night, and a new initiative with our Chemistry Department for Chemistry Week. This year's Chemistry Week theme is astrochemistry, and so we will do a public lecture on the origin of the ele- ments in stars with door prizes and information sup- plied by Chemistry. We hope this will be an annual event.



REMEMBER  
YOUR STATE  
COORDINATOR!

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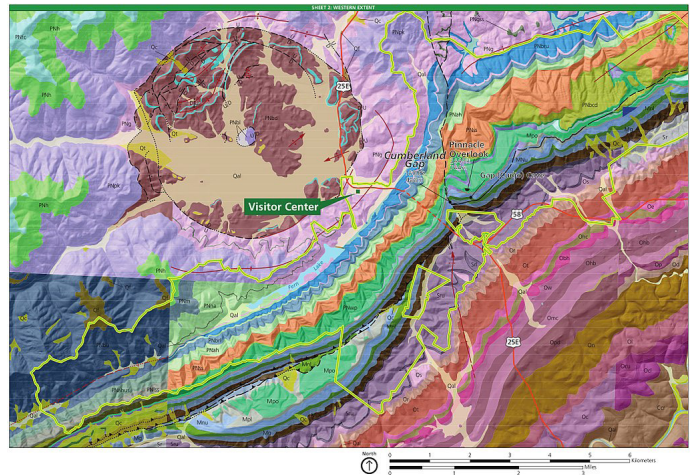
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# Archaeoastronomy

By Woodrow W. Grizzle III  
Jonesville, Virginia

Lee County, my home, is part of a region rich in astronomical heritage. There's natural heritage; less than 300 million years ago, a meteorite some 100 meters in diameter impacted the Earth near what is now the tri-state point of Virginia, Kentucky, and Tennessee. The resulting impact crater is about six kilometers across, and the town of Middlesboro, Kentucky exists within it—the only place in the world where coal is mined from within an impact crater. There's anthropological heritage; Daniel Boone used his astronomical knowledge here to get the better of the Shawnee on two separate occasions. There are also Indian mounds. Perhaps also these mounds demonstrate alignments.

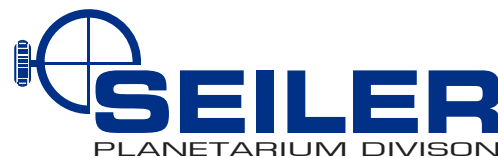


*Meteor crater near Middlesboro, Kentucky.*

Three large ceremonial mounds exist in Lee County. Two of these mound, perhaps to the benefit of their preservation, have remained largely unknown in popular culture, even to locals. The third and largest mound is, however, locally famous (though not respected). Known as Ely Mound, this largest mound is the best-preserved Mississippian culture site in the Commonwealth. It is easily seen from U.S. Hwy 58 on the old Ely farm about halfway between Rose Hill and Ewing. A white historical marker stands by the roadside calling the attention of passing motorists to the mound. A small, well-kept white barn with a black sheet-metal roof stands behind the mound as seen from the highway. Behind the barn, lush, green foothills rise gently before the steep slope of Cumberland Mountain.

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*Continued from page 27*

It is a beautiful place, where morning fog spilling over the mountain from Kentucky is a common sight. The rays of the rising sun shine directly along the mountain's southern slope, illuminating the valley below, with pure golden light.



*The Ely Mound*

Who built the mound is a contentious issue. The state historical marker indicating Ely Mound states a contradiction for all the world to see.

*“A short distance north is the Ely Mound, the best-preserved Indian mound in Virginia. It dates to the Late Woodland-Mississippian Period (AD 1200-1650), during which more complex societies and practices evolved, including chiefdoms and religious ceremonies. Often, temples, elite residences, and council buildings stood atop substructure or town-house mounds such as Ely Mound. Lucien Carr, assistant curator of the Peabody Museum in Boston, led an excavation here in 1877. By proving the connection between this mound and present-day Indians, Carr refuted the then-popular ‘lost race’ hypothesis for Mound Builders in eastern North America.”*

The marker says a lot but nothing at all. Ely Mound, by all evidence indeed dates to the Late Woodland Mississippian period, though most sources indicate the end of the Mississippian period to be A.D. 1600, not 1650. Further confounding the issue, the marker goes on to say that Lucien Carr's findings proved “the connection between this mound and present-day Indians”. Careful the sign is not to say which present-day Indians are implied. Also, it is unclear whether the Indians in question were contemporary to Carr (1877) or to the casting of the sign (2000). In either case, the Mississippian culture died out by A.D. 1600–277 years before Carr's research and or a full four centuries before the historical marker was cast—definitely not

present-day for either. This anachronism calls into question how, exactly it was that Carr “refuted the then-popular ‘lost race’ hypothesis for Mound Builders in eastern North America.” Reading Carr's report reveals that his “refute” was simply to attribute the mound to the Cherokee and to blatantly characterize anyone who said otherwise as ignorant, and in the case of the Cherokee themselves as “ignorant savages”.

Carr, who was assistant curator of the Peabody Museum at Harvard, left behind an anthropological study on Ely Mound that strikes the modern ear, as do many other studies of Indians at the time, as profoundly racist, and eager to cover up any lapses in his own scholarship by blaming his own shortcomings on the “nature of savages and their inherent limitations”.

Locals here in Lee County think little of Ely Mound and even less of who may or may not have built it. The current owners graze cattle on it and routinely drive over it with four-wheelers so much so that ATV tracks are obvious in satellite imagery. Ely Mound's designation on the National Register of Historic Places and the Virginia Landmarks Register is meaningless. As a student of archaeoastronomy, the question intrigues me—at times to the point of obsession. Observational astronomy is not known to be a strong characteristic of the Cherokee.

The Mississippians, on the other hand, were astronomers, and there are a number of Mississippian archaeoastronomy sites. The most famous are a pair of different observatories at the Mississippian spiritual center of Cahokia in modern day southern Illinois. Cahokia demonstrates two significant archaeoastronomical alignments: the Cahokia Woodhenge and the maximum southern moonrise alignment of Rattlesnake Causeway. Should an alignment be proven at Ely Mound, it would help to solidify the idea that Ely Mound is of Mississippian origin and help to debunk Carr's scholarship.

While I am unable to visit Ely Mound and conduct thorough research at this time. Two particular features have come to my attention from looking at satellite imagery of the site and from driving by it so many times over the course of my life.

The first is the juxtaposition of the mound with the mountain ridge immediately to the north-northwest. A

prominent outcropping of white limestone called White Rocks dominates the ridge line near Ely Mound. It runs for perhaps a mile or more down the ridge line. It is prominent today, and it was a prominent landmark along the Wilderness Road in the late 18th century. Daniel Boone led many settlers along the Wilderness Road from Kingsport, Tennessee to Cumberland Gap and into Kentucky. It is well documented that the White Rocks marked a significant point along the Wilderness Road; sight of them meant that reaching Cumberland Gap was only one more day's journey. The White Rocks are mostly at the same elevation as the rest of the ridge, except for the western-most end, where they rise up significantly forming a peak. The sun often sets near this peak in the spring and fall. As I cannot visit the Ely Mound, I cannot verify the extent of a sunset alignment, but it is definitely close enough to warrant further exploration.

The other potential alignment shows up on satellite imagery. Ely Mound is slightly oval in shape with a flattened summit. Satellite pictures show that the long axis appears to line up fairly closely to the local meridian. Close measurement of the image using Google's tools reveals an angular differentiation of about 5° between the local meridian and Ely Mound's long axis. Calculating to allow for precession in the year A.D. 1200 accounts for a difference of about 4°30'—close. Finer calculations will have to wait until an extensive on-site investigation can be made. That being said, enough evidence exists to warrant further exploration. Hopefully, future scholarship on this matter will appear in this journal in the near future.

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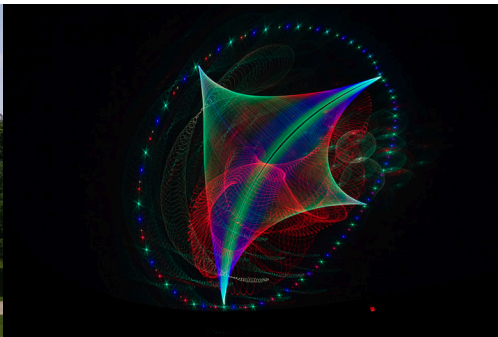


*Alignment of the Ely mound.*



# SEPA 2018

Photos by Adam Thanz





# News from the International Planetarium Society

The largest association of planetarium professionals in the world.

The International Planetarium Society is pleased to announce that Mark SubbaRao, director of the Adler Planetarium's Space Visualization Group (Chicago, Illinois), will take the reins as president starting January 1, 2019, and that the society has elected a candidate from Japan, the first ever from this nation, as president-elect.



*Mark SubbaRao*

Kaoru Kimura from the Japan Science Foundation/Science Museum in Tokyo, begins a six-year commitment to the IPS in January. In the society, the leadership starts with president-elect and serves with the current president for two years before becoming president. Thus, in 2021, Kimura will become president and SubbaRao will transition to past president.



*Kaoru Kimura*

Current president Shawn Laatsch of the Emera Astronomy Center at the University of Maine in Orono, will become past president, and the current past president, Joanne Young, president of Audio Visual Imagineering in Orlando, Florida, will retire from the officer cadre.

Ms Kimura, a long-time IPS member and tireless representative for Japanese planetariums, has served as IPS Affiliate Representative for the Japan Planetarium Association and is an active member of the IPS Education Committee. Kaoru's active work with the Global Hands-on Universe, NASA Teacher Ambassador Program and

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education-public outreach program, as well as local astronomy-related organizations, demonstrates her commitment to spreading the word of the educational value of astronomy education and its relationship with planetariums.

Kaoru has devoted her professional career to educational outreach that incorporates the planetarium field. Her work at the Astronomical Museum and GOTOH Planetarium for 14 years, her experiences at the Yerkes Observatory for the Hands-on Universe Program, working with internet telescope systems, and outreach extensions through NASA and JAXA experiences have provided opportunities that she seizes to benefit her audiences.

Kaoru also is the first non-US female president, and also the first from Asia. IPS has had 24 presidents during its 48-year history. Of those, four have been from outside the U.S.: Terence Murtagh, 1989-90, from Ireland; Thomas Kraupe, 1997-98 and also 2013-14, Germany; Martin George, 2005-06, Australia; and Tom Mason, 2009-10, Ireland.

Patty Seaton, planetarium specialist at the Howard B. Owens Science Center in Lanham Seabrook, Maryland, was elected as executive secretary, and Ann Bragg, director of the Anderson Hancock Planetarium at Marietta College in Ohio, ran unopposed as treasurer.



*Patty Seaton*

Ms Seaton, who has been the Owens planetarium specialist since 2000, has developed Pre-K through college interactive science enrichment programs using the planetarium theater as a classroom. Prior to her current position, she was planetarium operator at the National Air and Space Museum from 1999–2004, after spending two years as a science resource teacher at Ardmore Elementary School. She has bachelor's and master's degrees in Astronomy/Science Education from University of Maryland College Park. Patty replaces Rachel Thompson, 7th grade science teacher at Forest Meadow Junior High School, Richardson Independent School District, Texas, who chose not to run again as secretary.

IPS is the largest organization of planetarium professionals in the world. Its membership consists of the many different people working to make planetariums succeed, from directors, presenters, and educators to teachers, artists, and vendors.

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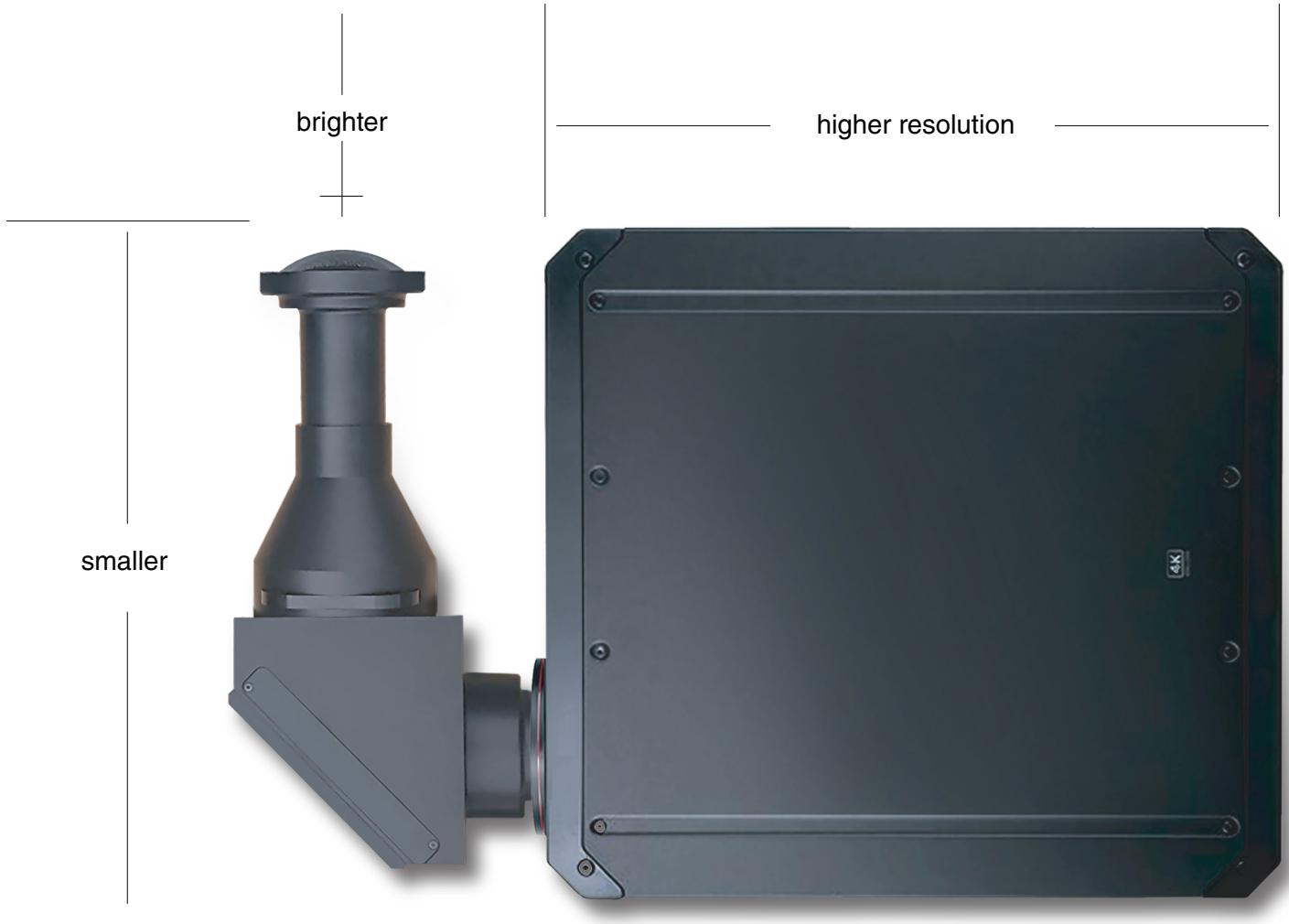
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*continued from page 32*

### **Additional information for IPS Affiliates:**

In addition to officers, IPS members also overwhelmingly approved several changes to the by-laws. Throughout, all instances of the word “council” will be placed with the word “board.”

Article IV, Section 4 has been changed to read “The Board shall appoint an Elections Committee consisting of a chair and at least six (6) additional committee members selected from the list of members of the society before January 1 of even-numbered years. As far as possible the committee shall include at least one (1) member from each of the six continental zones specified in Article VI, Section 1. The committee shall not include current officers.”

Article VI Section 1 has been replaced with: “The board shall consist of the officers and up to three board members from each of the following six geographic zones: Africa, North America, South America (including Central America and the Caribbean), Asia, Europe, and Oceania. The number of board members from each region shall be one for regions with fewer than 50 current IPS members; two for regions with between 50 and 499 current IPS members; and three for regions with 500 or more IPS members. IPS members in countries, or regions or territories of countries, which may be seen as belonging to more than one such zone, shall define the zone to which such countries or regions belong, with the final decision in this regard being made by the board. The word 'board' as herein used and the word 'directors' as may be used in the Articles of Incorporation and for other legal documents shall be held to mean one and the same thing. Members of the board must be current members of the society.”

Article VI Section 2 has been deleted.

The original Article VI Section 3 has been renumbered as Section 2, and has been changed to read: “Section 2. The elected officers and board members each have one vote at board meetings, except for the chair of the meeting, who shall not vote except to break a tie.”

A new Article VI Section 3 has been inserted: “Section 3. This Article shall be effective with the first seating of the Board.”

The IPS By-Laws and Standing Rules can be found at <https://www.ips-planetarium.org/page/rules>.

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