



# CONSTELLATION

Winter 2012, No. 4



***“Astronomy? Impossible to understand and madness to investigate.”***

***~ Sophocles  
420 BCE***

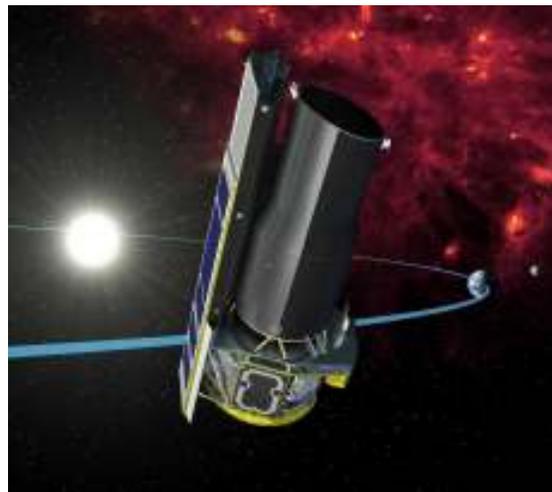
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## It Takes More Than Warm Porridge to Make a Goldilocks Zone

By Diane K. Fisher

The “Goldilocks Zone” describes the region of a solar system that is just the right distance from the star to make a cozy, comfy home for a life-supporting planet. It is a region that keeps the planet warm enough to have a liquid ocean, but not so warm that the ocean boils off into space. Obviously, Earth orbits the Sun in our solar system’s “Goldilocks Zone.”



But there are other conditions besides temperature that make our part of the solar system comfortable for life. Using infrared data from the Spitzer Space Telescope, along with theoretical models and archival observations, Rebecca Martin, a NASA Sagan Fellow from the University of Colorado in Boulder, and astronomer Mario Livio of the Space Telescope Science Institute in Baltimore, Maryland, have published a new study suggesting that our solar system and our place in it is special in at least one other way.

This fortunate “just right” condition involves Jupiter and its effect on the asteroid belt.

Many other solar systems discovered in the past decade have giant gas planets in very tight orbits around their stars.

*(Continued on page 2)*

Only 19 out of 520 solar systems studied have Jupiter-like planets in orbits beyond what is known as the “snow line”—the distance from the star at which it is cool enough for water (and ammonia and methane) to condense into ice. Scientists believe our Jupiter formed a bit farther away from the Sun than it is now. Although the giant planet has moved a little closer to the Sun, it is still beyond the snow line.

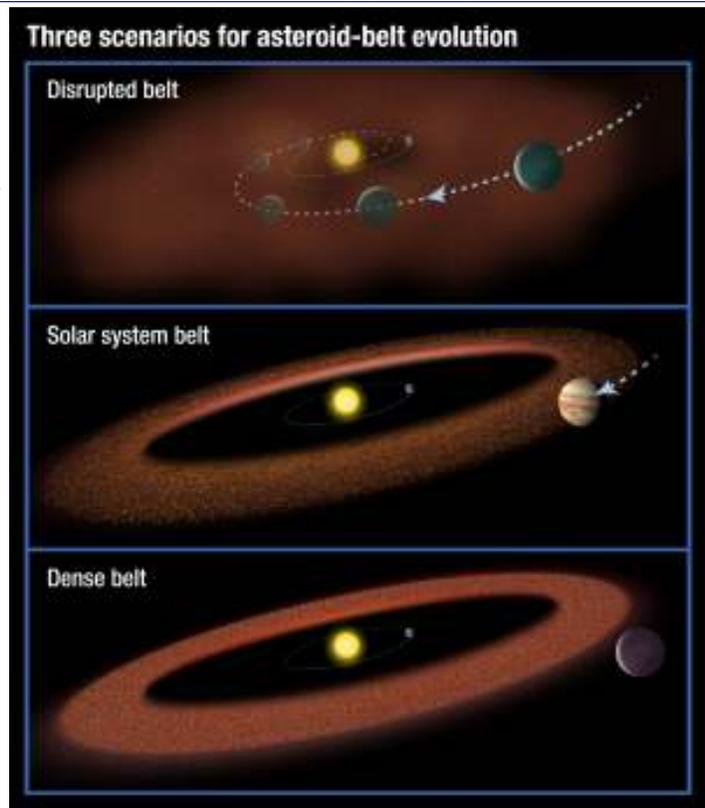
So why do we care where Jupiter hangs out? Well, the gravity of Jupiter, with its mass of 318 Earths, has a profound effect on everything in its region, including the asteroid belt. The asteroid belt is a region between Mars and Jupiter where millions of mostly rocky objects (some water-bearing) orbit. They range in size from dwarf planet Ceres at more than 600 miles in diameter to grains of dust. In the early solar system, asteroids (along with comets) could have been partly responsible for delivering water to fill the ocean of a young Earth. They could have also brought organic molecules to Earth, from which life eventually evolved.

Jupiter’s gravity keeps the asteroids pretty much in their place in the asteroid belt, and doesn’t let them accrete to form another planet. If Jupiter had moved inward through the asteroid belt toward the Sun, it would have scattered the asteroids in all directions before Earth had time to form. And no asteroid belt means no impacts on Earth, no water delivery, and maybe no life-starting molecules either. Asteroids may have also delivered such useful metals as gold, platinum, and iron to Earth’s crust.

But, if Jupiter had not migrated inward at all since it formed farther away from the Sun, the asteroid belt would be totally undisturbed and would be a lot more dense with asteroids than it is now. In that case, Earth would have been blasted with a lot more asteroid impacts, and life may have never had a chance to take root.

The infrared data from the Spitzer Space Telescope contributes in unexpected ways in revealing and supporting new ideas and theories about our universe. Read more about this study and other Spitzer contributions at [spitzer.caltech.edu](http://spitzer.caltech.edu). Kids can learn about infrared light and enjoy solving Spitzer image puzzles at [spaceplace.nasa.gov/spitzer-slyder](http://spaceplace.nasa.gov/spitzer-slyder).

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*



*Our solar system is represented by the middle scenario, where the gas giant planet has migrated inward, but still remains beyond the asteroid belt.*

# **MAPS IN MARYLAND**

## **July 17-20, 2013**

Save the Date – MAPS Conference will be held July 17-20, 2013 at the Earth and Space Science Lab in Frederick, Maryland.

This year's theme is – ***“Spaceship Earth; Educating its Crew”***

### **What's Different?**

**Pre-Conference Event** - “Livefest” - Tuesday, July 16, 9:00 a.m. - 5:00 p.m. This event will be sponsored by PIPS - Powerful Interactive Planetarium Systems! It will feature tons of live lessons, the use of several portable domes, and the ESSL planetarium and classrooms. All are encouraged to take advantage of this unique opportunity by coming early for this event!

**Transitional Conference Event** – Wednesday, July 17, from 10:00 a.m. - 1:30 p.m.! Participants will take a trip to the Robinson Nature Center, tour the facility and grounds, and see the Spitz SciDome in action with a focus on interactive planetarium lessons. Lunch is sponsored by Spitz, Inc.

MAPS members are encouraged to come early and PIPS members are encouraged to stay late!

### **Tentative Presentations and Activities:**

- ◆ Earth - Moon models
- ◆ Fundraising/Funding Panel
- ◆ Cosmology Panel
- ◆ 3D Show Production
- ◆ Blender
- ◆ Moon Presentations
- ◆ Constellation and Astronomy Trivia competitions
- ◆ Scavenger Hunts
- ◆ ...and great speakers, great food, and much more!

**Needed:** Activity and Lesson Presenters, Shoot Your Mouth Off Presenters, Participants – lots of participants!

**Contact:** [Jeffrey.grills@fcps.org](mailto:Jeffrey.grills@fcps.org) or [Mark.Bowman@fcps.org](mailto:Mark.Bowman@fcps.org)

## CONTACT!

### MAPS Executive Committee

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(215) 870-3725.

## President's Message

I think this is my favorite season in the planetarium. As soon as we get back from our Thanksgiving break, we begin with our kindergarten program written in-house by my colleague, Russ Waugh: "Susie's Snowflake". We run three programs a day, with a special "second" part to the program where we take the students to a mini-auditorium area and do demonstrations involving air. We get anywhere from 200-300 kindergarteners a day, and it is simply delightful!

Why? Because kids this age haven't lost sight of the magic. They "ooohhh" and "ahhhhh" when we bring up a simple slide of a globular cluster. They spontaneously clap when we first bring up the stars! They are visually and verbally captivated by the snow effect... and say the funniest things! My favorite comments so far include one student who kept asking me throughout the program, while pointing to the planetarium star projector, "Is that real?!" My other favorite was when we put up the overlay of Orion, and a student gasped loudly, "That's God!"

We bring a certain magic to our audiences of all ages, regardless of our projection system and technology. It's all about who WE are, and the quality of the programs we present; the passion in which we do our work; the joy of having a job that we sincerely love. It is rewarding to bring such magic to others, knowing that they are learning something they may never forget... and we have the honor of being the ones to provide it. Wow!

So, this season, celebrate after the solstice that we were all right about the whole Mayan Calendar controversy. That we were able to seize the opportunity to better educate audiences on that very topic! And that we can continue to bring magical moments for many seasons to come. Cheers!

### *Patty Seaton*

MAPS President  
Planetarium Director  
H.B. Owens Science Center  
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## ELECTIONS 2013

The following are statements from the candidates for the 2013 elections for MAPS Officers.

### PRESIDENT

#### Jerry Vinski

Hello fellow MAPS members,

Growing up in Western Pennsylvania, my first visit to and memory of a planetarium was the Buhl to see The Star of Bethlehem when I was 7 years old. Eleven years later I started my career in the planetarium field when I attended Clarion University of PA in 1975 and worked as a student presenter. In 1980 I took an eight month leave from graduate school at Clarion to work at the North Museum Planetarium. Besides creating and presenting shows, I was given the task of recruiting and training volunteer show presenters. Returning to Clarion, I received a master's degree in science education with a concentration in astronomy education. From 1981 to 1988 I directed the Newark Museum Planetarium. Since 1988 I have been at Raritan Valley Community College as its first and only planetarium director. I first joined MAPS in 1981 and over the years I have presented many papers, hosted the 1995 conference and previously served a term on its Board.



Video projection in the planetarium became a big part of planetarium programs in the early 90's. Since then, computer and projection technology has taken over our domes from how many of us got started working with opto-mechanical star machines and auxiliary projectors. New technology has many advantages and disadvantages and it definitely has brought change with it. However, I feel it is only a tool. It is a tool that we should be used to help explain a concept. How that is accomplished is the challenge. Technology may change how we teach but it doesn't change what we teach. Astronomy is part of the National Science Standards and in some form it is in all of the state standards. Students still need to understand Moon phases and the reason for seasons. Older students are expected to understand the size and scale of the Universe, how stars form and die, how Galaxies evolve and the role of Dark Matter and Dark Energy in the Universe. Thus, how a presenter interacts with the audience hasn't changed, only the tools have changed. Whether it is with slides, DVD's, movies, or paper and pencil, the planetarium teacher uses these tools to engage, explore, explain, elaborate and evaluate the audience as much as possible in every presentation they conduct on those science standards. We as Planetarians educate and inspire our audience whether formally or informally.

If elected President of MAPS, I will work with the Board, fellow officers and members to increase the professionalism of our field and reach out to the many institutions with planetariums that are not members and are not fully utilizing their facilities. We must convince school and museum administrators to support their staff members to become actively involved in MAPS and use it as the source of professional development that it is for the planetarium profession.

## SECRETARY

### Jeff Dunn

My name is Jeff Dunn and I am the new supervisor of the Treworgy Planetarium of Mystic Seaport Museum of America and the Sea. My mission is to increase the number of educational outreach activities, attendance and visibility of the planetarium. To achieve these objectives I have developed a number of social media pages, developed new outreach activities and have registered the Treworgy Planetarium as a member of Middle Atlantic Planetarium Society (MAPS) and the International Planetarium Society (IPS). These last two organizations have already been sources of great inspiration and information and I am excited to become involved at a higher level with MAPS and am running for the position of secretary. Below I discuss some thoughts and ideas that I would like to bring to this position that I had while attending the IPS meeting in July.



Being relatively new to the profession I was struck by how many planetarians I met at the IPS meeting in Baton Rouge, LA. The multitude of planetariums that were represented was wide and varied but shared one thing in common: passion. That passion was evident in the MAPS members I met and talked with at the conference. I was struck by the large number of MAPS members and its broad geographic reach. What also was clear was that this large family came with a wide range of capabilities, each specific to their own planetarium. Many of our planetariums excel in particular content areas or presentation styles and have routines, scripts and exercises that have been refined and work very well. The Treworgy Planetarium gives a great live show explaining celestial navigation, but it could benefit from trying out a technique or content area from a sister institution.

This thought led to an imagined shared pool of expertise and knowledge that could be drawn upon to expand our offerings. Surely conferences meet these needs? Most certainly! Conferences are wonderful and cannot be substituted; there is nothing like face time with friends and colleagues. What if next year your travel budget is limited and you cannot visit the annual conference? What then?

You know there must be a member of MAPS that could help you with a project but you've never met them or had a chance to communicate because the geographic and social space was too great. In this era of communication the technology exists to make these connections possible. We already have a member resource area on our polished website, but what if this area grew to become an online clearinghouse with a library of scripts, lesson plans, videos and other resources would allow us to share our successes with other MAPS partners. The uploaded resources could be shared with the Creative Commons license, released for use, improved upon or adapted and returned to the clearinghouse with new features and options for others to use. Finally, streaming video makes it possible to share meetings, news briefs and mini workshops with our members or the public. The friction of distance should have no impact on communication and collaboration with each other.

If elected to secretary I would strive to develop communication between our members to enable each other's success. Email lists, newsletters and meeting minutes are the building blocks of being informed members. Let us begin leverage the tools of communication at our disposal to ensure success for ourselves and our community. Please consider voting for me as MAPS secretary, I will endeavor in earnest to make a positive impact in this position.

Jeff has earned a B.S. in elementary education from Kutztown University of Pennsylvania and a M.A. in geography and satellite remote sensing from West Virginia University. Afterwards he pursued a PhD in geography at the University of Connecticut where he worked at the University of Connecticut Libraries Map and Geographic Information Center. For more information about Jeff please visit: <http://goo.gl/b4gZ9>.

**More Candidates on Page 9...**

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## ELECTION CANDIDATES

### SECRETARY

#### Stephen Dubois

Stephen Dubois has been around his hometown Planetarium for his entire life. When the Buffalo State College Planetarium opened in 1964, Stephen's father Robert, a Physics professor, was asked to be co-administrator of the new facility. Two years later, Dr. James Orgren replaced Robert and accepted the newly created position of full-time Director. During times when Steve would travel with his father to campus, a visit under the dome with "Dr. O". was always a highlight.

As a young teenager, Steve began to learn the night sky and after the summer of 1983 he set his goals on seriously studying astronomy. It was inevitable that he would again cross paths with the rebuilt and renamed Whitworth Ferguson Planetarium when he began his first semester of college at Buffalo State in 1986. He joined the Astronomy Club and held many key positions throughout his college years. In 1987, Steve was formally trained as an operator and has been working at the planetarium ever since. He has also taught astronomy for the last 26 years as a merit badge counselor at scout camps throughout the Western New York area.



An advocate of both new technology and traditional educational values, Steve believes that, first and foremost, a planetarium should replicate the experience of viewing the night sky under perfect conditions. In other words, the stars should always be central focus of any planetarium. Steve has been presenting live shows under the Ferguson dome for 25 years as well as working for Ancient Eyes Productions as a music composer, illustrator and writer. Additionally, he has served as show director, music director and composer, author and production designer on a wide variety of multimedia public show presentations at the Ferguson Planetarium.

Stephen says: It has been an exciting and productive two years thus far and I am eager to continue working with the Executive Board. I feel that I have been making valuable contributions and would be honored if you would re-elect me to continue. I will represent well the mission statement of the Middle Atlantic Planetarium Society and you, the membership.

### TREASURER

#### Keith H. Johnson

Keith Johnson ([users.rowan.edu/~johnsonk/](http://users.rowan.edu/~johnsonk/)) is the director of the Edelman Planetarium ([www.rowan.edu/planetarium/](http://www.rowan.edu/planetarium/)) at Rowan University in Glassboro NJ. He was the first director appointed to this new facility 8+ years ago, though the Department of Physics and Astronomy is still searching for someone to supplant him.

Keith has been involved in planetarium organizations since he started in the field about 20 (Mars) years ago. He has served as treasurer for the Southwestern Association of Planetariums, the Pacific Planetarium Association, and the International Planetarium Society, all of whom were quite pleased when he found a new job on the East Coast and was elected MAPS treasurer. He also wrote a column on astronomical software for The Planetarian for several years, until computers had more memory than he did.



Keith was fortunate to experience a bit of real astronomy before getting involved in the virtual version. He was a founding editor of the Journal of the Pocahontas County Astronomical Society ([users.rowan.edu/~johnsonk/KHJsemipro.html](http://users.rowan.edu/~johnsonk/KHJsemipro.html)) at NRAO in Green Bank. He earned, or at least received, an M.S. in astronomy from the University of Arizona, and his thesis advisor has finally given up fighting that in the courts. He appreciates the trust his fellow members have seen fit to give him over the past few years, and promises to administer the treasury of the society to the best of his ability.

# THE MOON

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## EDUCATION COMMITTEE

As children (and those of us adults still in contact with our inner-child) search the Holiday skies for signs of Rudolph's bright red nose, there is the opportunity to share with all of our planetarium visitors the fact that the sky itself is lit like a Christmas tree, with lights of many colors.

During the recent lighting of the Rockefeller Center tree on television I myself noticed that from a distance the tree lights all looked white - but then upon closer inspection one could resolve the distinctive blues, greens, yellows, oranges, and red twinkling bulbs. So many dazzling stars fill the sky with their colors at this time of year - Betelgeuse, Rigel, Sirius, Aldebaran. Then add the red-orange hue of Mars, the gold of Saturn, the yellow of Venus and the sky blazes forth with even more colorful objects. So sad that so few people take the time to even look, and most who do miss the colors all together.

Encourage your students and guests to grab that sweater, scarf, and pair of gloves to venture out into the cold winter night and enjoy the colors of the season - and they might even spot that sleigh with the reindeer lead by that bright red nose!

John Scala  
Lenape Valley Regional High School, Stanhope, NJ  
jscala@lvhs.org



The Christmas Tree Cluster

© Davide De Martin  
skyfactory.org

## What College Students Know (and Don't Know) About Astronomy

By Kristin Chon, Framingham State University Planetarium

We all have stories about how little astronomy people actually know. We've all fielded questions from our planetarium visitors, like "Where's Earth in the sky?" We've cringed at commercials that show people floating on the Moon. But just how pervasive are astronomical misconceptions? There have been quite a few papers in education journals written about astronomy misconceptions, and quite a few surveys done. Lots of these have been done with K-12 students, some with college students, but very little with the general public.

A few years ago I surveyed over 500 college students about their misconceptions. In a written questionnaire, I asked them 14-15 questions (there were two slightly different versions of the survey) about basic astronomy topics. Some of the basic ideas I was looking for were: Do they know that the Sun is a star? Do they know what sorts of objects are in our solar system (planets, asteroids, etc., but no stars other than the Sun)? Do they know the basic difference between a solar system and a galaxy? Do they know the basic difference between stars and planets? Do they have any sense of scale by size and/or distance? Do they know what the Big Bang was? Even though these are all very basic concepts, I know students have a lot of misconceptions regarding them. I created the survey to see just how extensive those misconceptions are among college students.

From researching the literature, I have learned that there is really only one concept that we can assume

*(Continued on page 12)*

virtually all college students understand – that Earth is round. Beyond that, you can be certain that students – in your classroom or in your planetarium – have misconceptions about everything else. Most do know that Earth orbits the Sun, but not all. Likewise, most know that the sun is larger than Earth, but not all. But just how many is “most”? Below is a list of the survey questions, along with the percentage of students that had fully correct answers.

1. What is the Sun? 76%
- 2a. What is the difference between the Sun and a planet? 29%
- 2b. What is the difference between a planet and a star? 17%
3. Are most stars much bigger than, much smaller than, or roughly the same size as our Sun. Explain. 36%
4. How many stars are there in our solar system? 29%
5. How many stars are there in our galaxy? 16%
- 6a. What is a comet? 4%
- 7a. What is an asteroid? 1%
- 6b. What types of objects are in our solar system? 22%
- 8a. What is a galaxy? 52%
- 8b. What types of objects are in our galaxy? 43%
9. What is the universe? 50%
10. What is at the center of our solar system? 89%
11. What is at the center of our galaxy? 11%
12. What is at the center of our universe? 4%
13. What was the Big Bang? 33%
14. Put the following objects in order from the closest to Earth to the farthest from Earth: Sun, the Andromeda Galaxy, Space shuttle in orbit, the stars we can see in the night sky, Moon, Pluto, the center of the Milky Way galaxy, Jupiter. 6%
15. Put the following objects in order from smallest to largest: Earth, Moon, Sun, Saturn, The North Star. 39%

Since the students’ responses were mostly open-ended, I received some rather interesting answers to some questions? For example, here are some of the responses to the question “What is the difference between a planet and a star?”:

- ◆ “A planet rotates around the moon and stars stay in one place.”
- ◆ “I live on a planet and so does Burt Reynolds.”
- ◆ “A planet is one object, whereas stars are a billion of small objects.”

Out of the 310 students who were given this question, 25 indicated that stars are smaller than planets, and 7 said that planets are or were stars.

There were some misconceptions students expressed that I didn’t even know existed prior to this survey. For example, the question “What is at the center of our solar system” was the easiest question on the survey, with 89% of students knowing it’s the Sun. Yet two students said it was our Moon, and three said “the core” – of what I am not entirely sure? Most shocking to me, though, were the misconceptions about the Big Bang. I’m familiar with the misconception that the Big Bang created the solar system (which 30% of students said). But quite a few students believe that the Big Bang was when a large object crashed into Earth, and some specifically mentioned that the Big Bang killed the dinosaurs.

So what can we do about these misconceptions? Numerous studies have shown that simply telling people that their misconception is wrong and what the correct conception is often doesn’t “fix” the misconception. But that’s the beauty of the planetarium – we can engage people, we can ask them questions and get them to really think about astronomy, and then real learning can take place!

## Lens Making at GOTO INC

GOTO INC has been in the lens grinding business for nearly a century. In fact, even before there was a GOTO INC, there was a Goto grinding glass for a famous Japanese camera company. That man was Seizo Goto, founder of GOTO INC. Seizo soon mastered the skills necessary to grind quality lenses and set off to start his own business - making telescopes.

Over the years, GOTO moved from telescopes, to periscopes, to planetariums and fisheye movie camera and projection lenses. Today, one of the main lines of business for GOTO is the production of quality video projection lenses. This business is so good that GOTO's optical lab is working full time to keep up with video lens orders!

The dome environment is a challenging one for most lens manufacturers. Especially at the outer edges of a projected image, many dome systems show lack of focus, asymmetrical star images, or chromatic aberration. Likewise, internal reflections can cause contrast loss, and a poorly designed lens can lose light output.

All of these challenges have been met by GOTO for decades now, since GOTO began designing and manufacturing wide angle and fisheye lenses for GOTO Astrovision large format film projectors. In fact, every lens produced for use inside a planetarium is optimized for use on spherical, not flat, surfaces.

Special anti-reflective coatings and internal, motorized irises keep contrast extremely high, and help realize GOTO's goal of inky-black skies with tiny, beautiful stars.

GOTO's line of video projection lenses include models designed for the latest SONY and JVC 4K projectors, as well as many projectors which can be used in 2K applications. Future lens development continues, so users are encouraged to contact GOTO if they have specific questions or requests for lenses to match any new projectors.



JVC 4K projector lens



CHIRON II star plate



Mr. Ikeda has been grinding and polishing lenses at GOTO for 40 years. From roughing out shapes to final testing and polishing, he and several other optical craftsmen do it all.

### To learn more, contact:

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Contact: Ken Miller

## CONSTELLATION DEADLINES

The Constellation is published quarterly near the equinoxes and solstices. Please keep in mind the following deadlines:

Cover Date	Deadline
March 2013	Friday, Mar. 1
June 2013	Friday, Jun. 7
September 2013	Friday, Sep. 7
December 2013	Friday, Dec. 6

Submissions should be sent to the editor:

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Denville, NJ 07834

Phone #: (973) 596-6609  
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## Everyone's Universe

Observatories and planetarium shows are places many people visit to learn about the night sky. But what if you have a different learning style or a physical disability? Does that mean the night sky is not available to you?

The second edition of Noreen Grice's book, *Everyone's Universe: A Guide to Accessible Astronomy Places*, shows how accessible the universe can be! She describes educational strategies for making astronomy events accessible and fun for all participants, and especially people who have physical or neurological disabilities. The book also includes a state-by-state travel guide to accessible planetariums and observatories, with icons, photographs and descriptive text.



Everyone's Universe (Second Edition)  
Paperback: 336 pages  
Publisher: You Can Do Astronomy LLC (July 2012)  
Print: ISBN-978-0-9833567-3-8  
Ebook ISBN-978-0-9833567-4-5

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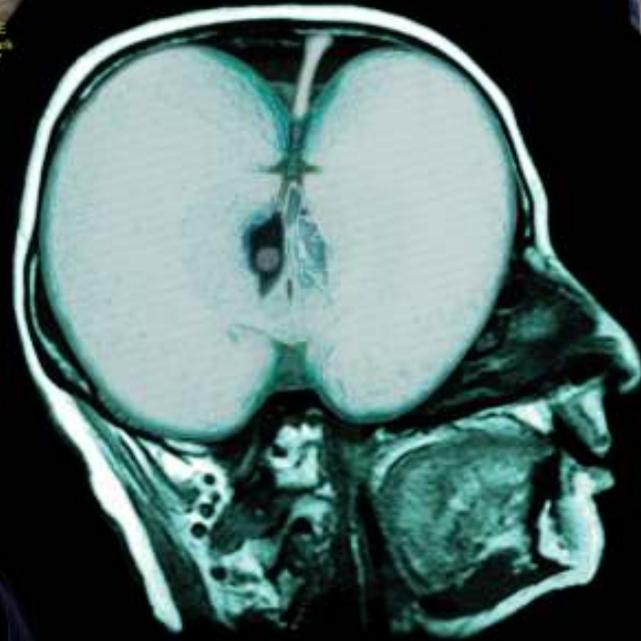
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