



# THE STAR

THE NEWSLETTER OF THE  
MOUNT CUBA ASTRONOMICAL GROUP  
VOL. 2 NUM. 6 FEBRUARY 2014

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OUR PROGRAMS ARE HELD THE SECOND TUESDAY OF EACH  
MONTH AT 7:30 P.M. UNLESS INDICATED OTHERWISE  
MOUNT CUBA ASTRONOMICAL OBSERVATORY

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**FEBRUARY MEETING**  
**TUESDAY THE 11<sup>TH</sup> 7:30 p.m.**

Carolyn Stankiewicz will conclude her presentation from the January meeting by showing the CD “Journey to the Stars.” Featuring our sun and beyond. This program is now showing at the Air and Space Museum in Washington, D.C. Whoopi Goldbery is the narrator. I have seen this and it is very well done.

**JANUARY MEETING REVIEW**

Mary Anna Webb and Robert Stack gave a very informative talk on the life and time of Annie Jump Cannon. I asked them to do a short write up that would appear in this months STAR. Mary was gracious to do so. See more on Annie below.

Carolyn Stankiewicz spoke on “Astronomy and Astrology. Same Roots” and did an excellent presentation on debunking Astrology.

**The View from a Comfortable Chair**

Hank Bouchelle

I have to admit that I have always loved the cold, and especially snow. My grandfather often spoke of the occasions in his youth when the Susquehanna River froze solid, and roads and railroad tracks across it afforded a shortcut before the construction of the Conowingo Dam. There were towns on the Harford County side of the river that were scraped away by massive ice flows. A school in Port Deposit was forced to close when flood waters brought an outbreak of diphtheria.

Youngsters today just have to deal with the fact that they missed, unalterably, these and other really good stuff: World War II ration coupons, whalebone corset stays, and Sputnik.

Winter has its advantages, though: There are long nights to observe the sky. We do not need a sunrise/sunset table to tell us that the Sun makes less of an appearance in winter, ([http://aa.usno.navy.mil/cgi-bin/aa\\_rstablew.pl](http://aa.usno.navy.mil/cgi-bin/aa_rstablew.pl)), even though the earliest sunset of the year occurs near December 7 (4:38 pm).

We may recall that while December 21 or thereabouts is the “shortest day of the year,” winter does not get really serious until January. And it is likely that if we were required to jump into a lake, we probably would rather do it on the first day of autumn rather than the first day of spring. There is a considerable delay in the time between the start of a season and its characteristic temperatures. Water requires a tremendous gain or loss of heat to change its temperature, so the expected temperatures are delayed.

## **Phenomena : *Jupiter and Its Satellites***

**Hank Bouchelle**

Earth's motion around the Sun has more of an impact on its changing position in the sky than Jupiter's. Jupiter's revolution requires approximately 12 years. Thus, were folks able to observe stars from Jupiter, the 'seasonal' changes in its sky would occur more leisurely. Jupiter's orbit is larger than Earth's, of course, so it has a larger circle to complete. Earth's velocity around the Sun is about 18 miles/second, while Jupiter's is a mere eight miles/second.

Be that as it may, Jupiter is currently a major presence in our night sky. Aside from the Moon, it is the brightest object in the sky, and near the zenith. Jupiter was known to the Ancients, but its four major satellites are a different story.

These satellites are huge: One is larger than Mercury. The order of their distance from Jupiter has an easy mnemonic: *I Eat Green Cheese* for Io, Europe, Ganymede, and Callisto. These satellites are sufficiently large and reflective that, were it not for Jupiter's glare, they would be visible to the naked eye. However, since Jupiter and Earth share nearly the same ecliptic, any one or all of its satellites may be hidden behind the planet or undetectable in front of it. Indeed, as one increases the ability of his or her telescope, the shadow of a satellite in front of the planet may be detected before the satellite itself. Io, the closest and smallest of these, requires a telescope to differentiate it from Jupiter's glare. Europe is also very difficult. For some of us, a solution to the problem of glare is to position oneself under a telephone or other wire so that the wire blocks the glare but reveals any satellites.

Historical records mention people who reported changes in points of light in the vicinity of Jupiter. However, the number of individuals with the required acuity is always vanishingly small, so the reports were routinely dismissed, or worse

As Galileo's reports of his observations of these satellites became generally known, individuals came forward to make a prior claim to this discovery. Galileo is the first person known to record his observations. And he was a sufficiently competent observer to correct an initial record that showed a satellite mistaken as a star.

You can find a translation of Galileo's book describing his observations, "Starry Messenger," with a direct translation and Galileo's original illustrations. It is a completely fascinating text, and well worth the short time it takes to read.

## **MCAG PUBLIC OUTREACH:**

### **SCHOOLS:**

On January 23<sup>rd</sup> several members of the MCAG attended the unveiling and celebration of the refurbished planetarium which was built in 1963 at the A. I. DuPont Middle School. Due in large part to the efforts of science teacher Jerry Hill, his students, Edward McGrath, Science Department head for the A. I. District and the knowledge and efforts of David Groski and Hank Beuchelle, both members of the MCAG the event was a huge success. All Science Teachers in the Red Clay District should take note of this resource and schedule a visit to the Planetarium for it should be taken as a great learning tool as well as a wonderful accomplishment of the Red Clay District.

The Science Olympiad Astronomy (Astrophysics) phase is well under way. There are several high school students who have signed up to participate from the Red Clay District as well as other districts state wide. This year's competition should be quite a lively one. The MCAG is quite happy to say that one of our members, Scott Jackson, is the supervisor for the Astronomy phase of Science Olympiad. I hope to be able to announce the winners in the March edition of the STAR.

### **TELESCOPE WORKSHOP:**

The next workshop is scheduled for February 27<sup>th</sup> at 7:30 in the shop at Mount Cuba Astronomical Observatory. All workshops will be held on the last Thursday of each month, same time and place unless notified otherwise.

Dave and crew will be more than glad to help anyone who brings in a Telescope in need of attention.

### **OTHER MCAG ACTIVITIES:**

On March 22<sup>nd</sup> and April 5<sup>th</sup>., the MCAG will hold Star Parties at Brandywine Creek State Park located at 41 Adams Dam Rd., Wilmington, DE 19807. If you would like to attend, call the Park [\(302\) 577-3534](tel:3025773534) in advance to register. There may be a small charge at the gate for the program. For MCAG members working the event, there is no admission fee. If weather is questionable, call park after 12 p.m. to see if event is cancelled.

#### **Directions:**

Google 41 Adams Dam Rd., Wilmington, DE 19807

## **STAR GAZING FOR FEBURARY**

**February 12– Moon at apogee (its farthest point from the Earth), 12 a.m.**

**February 22– Last Quarter Moon, 12:15 p.m. One-half of the Moon appears illuminated by direct sunlight while the illuminated part is decreasing.**

**February 25 – Full Moon, 6:53 p.m. The visible Moon is fully illuminated by direct sunlight. Though the Moon is only technically in this phase for a few seconds, it is considered “full” for the entire day of the event, and appears full for three days.**

**February 27– Moon at perigee (its closest point to the Earth), 3:00 p.m.**

### **WEB SITES OF INTEREST:**

**spaceweather.com**

**science1,nasa.com**

**<http://www.nasa.gov/centers/wallops/home/#.UsgzH9JDtYX>**

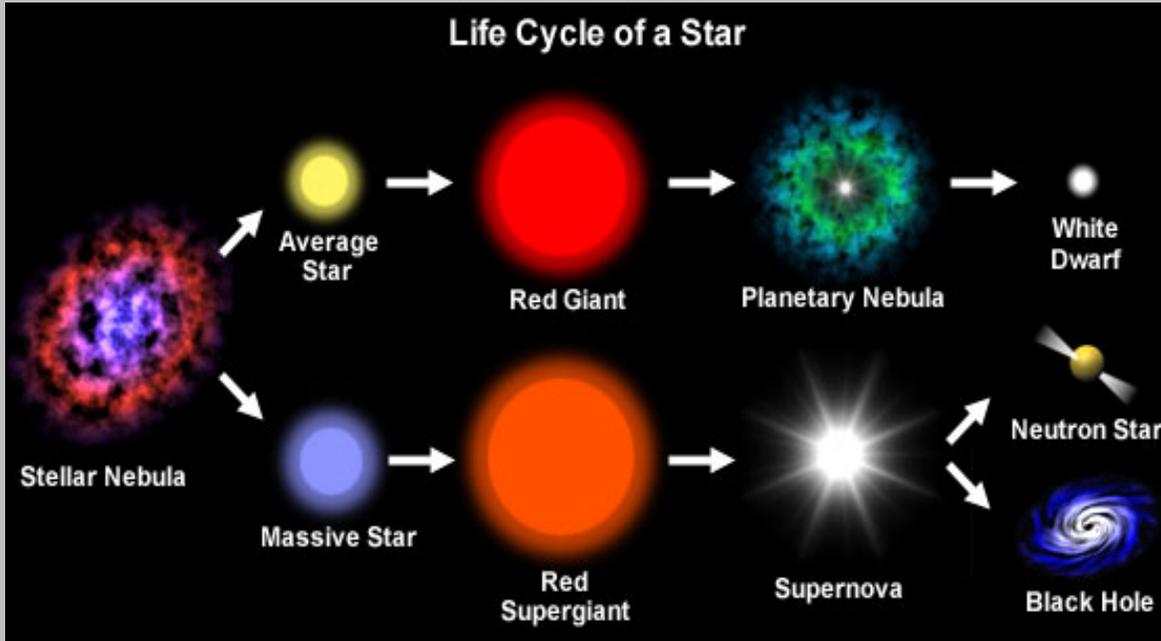
### **ASTRONOMICAL TERMS AND NAMES OF OBJECTS FOR THIS MONTH:**

**The Mission of the Mt. Cuba Astronomy Group is to increase the knowledge and expand awareness of the science of astronomy and related technologies.**

**When reading the articles in the STAR, you will come across various terms and names of objects you may not be familiar with. Therefore, in each edition of the STAR, we will review terms as well as objects related to Astronomy and related technologies. These topics are presented on a level that the general public can appreciate.**

**Nebula. A nebula (from Latin: "cloud") is an interstellar cloud of dust, hydrogen, helium and other ionized gases.**

## Life Cycle of a Star.



Our Sun will follow the path of an average Star which it happens to be today. It will slowly turn into a Red Giant and engulf the Earth. Its next phase will be that of a Planetary Nebula which simply put means it will begin to break up or perhaps blow up. In its final phase it will become a White Dwarf. However, there is nothing for us to fear for the Planetary Nebula phase will take place in approximately 6.5 billion years.

Ever wonder what a Star's chemical composition is?

Astronomers study the spectrum of the Sun to determine its chemical composition. In the visible region alone, from 4000 to 7000 angstroms ( $10^{-10}$  meters), there are thousands of absorption lines in the solar spectrum. These lines have been cataloged, and tell us that there are 67 chemical elements identified in the Sun. There are probably even more elements in the Sun that are present in such a small amount that our instruments can't detect them. Here is a table of the 10 most common elements in the Sun:

Element	Abundance (% of total number of atoms)	Abundance (% of total mass)
Hydrogen	91.2	71.0
Helium	8.7	27.1
Oxygen	0.078	0.97
Carbon	0.043	0.40
Nitrogen	0.0088	0.096
Silicon	0.0045	0.099
Magnesium	0.0038	0.076

Neon	0.0035	0.058
Iron	0.030	0.014
Sulfur	0.015	0.040

### **SMECTITES?**

You will see the term Smectites in the article on the Mars Rovers.

#### **Definition:**

Clay minerals are hydrous aluminium phyllosilicates, sometimes with variable amounts of iron, magnesium, alkali metals, alkaline earths, and other cations found on or near some planetary surfaces.

Clay minerals form in the presence of water and have been important to life, and many theories of abiogenesis involve them. They have been useful to humans since ancient times in agriculture and manufacturing.

### **THE PASSING OF A GIANT:**

Wednesday, January 15, 2014

**In Memoriam: John Dobson (1915 - 2014)**

It is with heavy hearts that we must report the passing of John Dobson. He died peacefully this morning, Wednesday, January 15th, in Burbank, California. He was 98 years old. He leaves behind a son, numerous close friends, and fans and admirers worldwide.

On March 8th, in honor of John, this year's ISAN (International Sidewalk Astronomy Night) will be dedicated to his memory. Amateur astronomers around the globe can join in and celebrate John's life and continue to carry the torch that he lit back in 1968 when he co-founded the San Francisco Sidewalk Astronomers.

### **NEWS FROM NASA:**

So what are the Mars Rovers up to?

NASA's decade-old Mars rover, Opportunity, has found evidence that life-friendly fresh water once pooled on the red planet's surface, reinforcing similar discoveries made by newcomer Curiosity on the other side of the planet. Opportunity, along with its now-defunct twin, Spirit, landed 10 years ago for concurrent 90-day missions to look for clues of the past existence of water.

**Both rovers did so, confirming evidence collected by orbiting spacecraft that Mars, the planet believed to be most like Earth in the solar system, was not always the cold, dry desert that appears today.**

**In August 2012, Curiosity, equipped with an onboard chemistry lab, arrived for follow-up investigations to determine if Mars had other ingredients essential for supporting life. The answer, returned very early in the ongoing mission, was a definite 'yes'.**

**On the other side of the planet, meanwhile, Opportunity has been analyzing water-bearing rocks at the rim of an ancient impact crater called Endeavour.**

**Rather than the chemical fingerprints of acidic, salty water found at previous sites, Opportunity discovered telltale clays called smectites that form in Ph-neutral water. According to one scientist studying the data "It's like drinking water,"**

**The finding adds to an emerging picture of a planet that spent its first billion years or so warmer than it is today, with pools of fresh water on its surface, scientists say. By studying rocks at various levels, scientists expect to not only get a better idea of how long the planet was able to sustain life, but where conditions might be favorable to perverse key evidence, such as organic carbon.**

#### **NASA LAUNCHES AND MUCH MORE:**

**For the first time in more than a decade, five NASA Earth science missions will be launched into space in the same year, opening new and improved remote eyes to monitor our changing planet.**

**The five launches, including two to the International Space Station (ISS), are part of an active year for NASA Earth science researchers, who also will conduct airborne campaigns to the poles and hurricanes, develop advanced sensor technologies, and use satellite data and analytical tools to improve natural hazard and climate change preparedness.**

**The planned launch schedule (subject to change) is:**

**Feb 27 - Global Precipitation Measurement (GPM) Core Observatory**

**June 6 - ISS-RapidScat**

**July - Orbiting Carbon Observatory (OCO)-2**

**September 12 - Cloud-Aerosol Transport System (CATS)**

**November - Soil Moisture Active Passive mission**

News and information, including videos, will be posted throughout the year at a new website: Earth Right Now <http://www.nasa.gov/earthrightnow>

Two new overview videos are available for download:

NASA 2014: Earth <http://www.youtube.com/watch?v=wYho0LhUw3M>

NASA Set for a Big Year in Earth Science:

<http://www.youtube.com/watch?v=DBjU8ZiuqCc&list=PLiuUQ9asub3SOdRC7ZHR8ocKHUcjlwtGW&index=2>

A media teleconference was held on January 21; you can listen to a replay of this approximately 45-minute media briefing by calling [888-566-0650](tel:888-566-0650) (through Jan. 29). An .mp3 file of the briefing will be available on the Museum Alliance member site next week.

The rest of the press release is below:

NASA satellites, aircraft and research help scientists and policymakers find answers to critical challenges facing our planet, including climate change, sea level rise, decreasing availability of fresh water and extreme weather events. "As NASA prepares for future missions to an asteroid and Mars, we're focused on Earth right now," said NASA Administrator Charles Bolden. "With five new missions set to launch in 2014, this really is shaping up to be the year of the Earth, and this focus on our home planet will make a significant difference in people's lives around the world."

The first NASA Earth science mission of 2014 is the Global Precipitation Measurement (GPM) Core

Observatory, a joint satellite project with the Japan Aerospace Exploration Agency (JAXA). The mission inaugurates an unprecedented international satellite constellation that will produce the first nearly global observations of rainfall and snowfall. This new information will help answer questions about our planet's life-sustaining water cycle, and improve water resource management and weather forecasting.

The GPM Core Observatory is scheduled to launch on Feb. 27 from JAXA's Tanegashima Space.

Center on a Japanese H-IIA rocket. The spacecraft was built at NASA's Goddard Space Flight Center, Greenbelt, Md.

In July, NASA will launch a mission to advance our understanding of carbon dioxide's role in climate change. The Orbiting Carbon Observatory (OCO)-2, a replacement for a mission lost after a launch vehicle failure in 2009, will make precise, global measurements of carbon dioxide, the greenhouse gas that is the largest human-

generated contributor to global warming. OCO-2 observations will be used to improve understanding of the natural and human-induced sources of carbon dioxide and how these emissions cycle through Earth's oceans, land and atmosphere.

OCO-2, managed by NASA's Jet Propulsion Laboratory in Pasadena, Calif., will launch from Vandenberg Air Force Base, Calif., on a Delta II rocket. With the November launch of NASA's Soil Moisture Active Passive (SMAP) mission, NASA will track Earth's water into one of its last hiding places: the soil. SMAP will map Earth's soil moisture and provide precise indications of the soil's freeze-thaw state, to improve understanding of the cycling of water, energy and carbon. High-resolution global maps of soil moisture produced from SMAP data will inform water resource management decisions on water availability around our planet. SMAP data also will aid in predictions of plant growth and agricultural productivity, weather and climate forecasts, and monitoring floods and droughts. SMAP, a JPL-managed mission, will launch from Vandenberg onboard a Delta II rocket.

"On our home planet Earth, water is an essential requirement for life and for most human activities.

We must understand the details of how water moves within and between the atmosphere, the oceans and the land if we are to predict changes to our climate and the availability of water resources," said Michael Freilich, director of NASA's Earth Science Division in Washington. "Coupled with data from other ongoing NASA missions that measure sea-surface salinity and that detect changes in underground aquifer levels, with GPM and SMAP we will have unprecedented measurements of our planet's vital water cycle."

Two Earth science missions will be sent to the International Space Station this year to measure ocean winds, clouds and aerosols, marking NASA's first use of the orbiting laboratory as a 24/7 Earth-observing platform. The new instruments are the first of a series that will observe Earth routinely from the orbiting laboratory.

The space station has served as a unique platform advancing scientific research and technological discovery for more than 13 years. Its mid-inclination orbit allows for observations at all local times over nearly 85 percent of Earth's surface. NASA plans to launch five Earth-observing instruments to the ISS through 2017. These missions are developed and operated jointly by the International Space Agency.

#### Station Program and the Earth Science Division.

ISS-RapidScat, managed by JPL and scheduled to launch to the station June 6, will extend the data record of ocean winds around the globe. These data are a key factor in climate research, weather and marine forecasting, and tracking of storms and hurricanes. Using inherited, repurposed hardware, ISS-RapidScat will provide high-value science at a fraction of the typical cost of developing a free-flying satellite. ISS-RapidScat will fly to the station aboard a SpaceX Falcon 9 rocket and Dragon cargo

spacecraft from Cape Canaveral Air Force Station, Fla., on a commercial resupply flight for the ISS.

The new Cloud-Aerosol Transport System (CATS) is a technology demonstration mission using three-wavelength lasers to extend satellite observations of small particles in the atmosphere from volcanoes, air pollution, dust and smoke. These aerosol particles pose human health risks at ground level and influence global climate through their impact on cloud cover and solar radiation in Earth's atmosphere. CATS is scheduled to launch Sept. 12 on another SpaceX ISS commercial resupply flight from Cape Canaveral Air Force Station.

"With these two instruments launching to the space station, ISS will come into its own as an important platform for studying the Earth system and global change," said Julie Robinson, space station chief scientist at NASA's Johnson Space Center in Houston. "This is just the beginning of the space station becoming a part of the global Earth-observing network."

NASA also uses a wide array of research aircraft equipped with sophisticated sensors to advance Earth science research. This year, NASA is sponsoring 12 flight campaigns that will study the polar ice sheets, urban air pollution, hurricanes, ecosystem health and more over the United States, Central and South America, Antarctica and the Arctic Circle.

Putting satellite data to work meeting local and regional needs around the world is another part of NASA's Earth science mission. In 2014, projects sponsored by the NASA Applied Sciences Program will tackle ecosystem issues in the Gulf of Mexico, water scarcity in the U.S. Southwest, and flood management in the Mekong River Delta.

NASA continues to push the boundaries of current technologies to find new ways to see our complex planet in more detail and with greater accuracy. This year, NASA's Earth Science Technology Office will test new sensors to improve measurements of water levels in lakes and reservoirs, carbon dioxide, terrestrial ecosystems, and natural hazards such as earthquakes and tsunamis.

NASA monitors Earth's vital signs from land, air and space with a fleet of satellites and ambitious airborne and ground-based observation campaigns. NASA develops new ways to observe and study Earth's interconnected natural systems with long-term data records and computer analysis tools to better see how our planet is changing. The agency shares this unique knowledge with the global community and works with institutions in the United States and around the world that contribute to understanding and protecting our home planet.

For more information about NASA's Earth science activities in 2014, visit:

<http://www.nasa.gov/earthrightnow>

For information on the latest NASA Earth science findings, visit:

<http://www.nasa.gov/earth>

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## **BLACK HOLES:**

**Do black holes exist? Not exactly in the way we think says Stephen Hawking.**

Black holes are the source of endless fascination and speculation. Do they hold the secrets of the universe and perhaps even the key to time travel itself?

We may never know the answers to those questions because famed theoretical physicist Stephen Hawking says black holes don't actually exist. At least not in the way we've been taught to think about them.

"The absence of event horizons mean that there are no black holes — in the sense of regimes from which light can't escape to infinity," Hawking writes in a new paper entitled, "Information Preservation and Weather Forecasting for Black Holes."

So, what does that mean exactly?

Well, what Hawking is saying is that he doesn't believe "event horizons," gravitational traps from which even light cannot escape, actually exist.

It's a "mind-bending theory" as New Scientist puts it, which ensures the debate will continue 40 years after Hawking first brought the concept of black holes to the public.

In his lecture "Into a Black Hole," Hawking described how an event horizon works:

"Falling through the event horizon, is a bit like going over Niagara Falls in a canoe. If you are above the falls, you can get away if you paddle fast enough, but once you are over the edge, you are lost. There's no way back. As you get nearer the falls, the current gets faster. This means it pulls harder on the front of the canoe, than the back. there's a danger that the canoe will be pulled apart. It is the same with black holes."

But now, Hawking says event horizons don't exist. However, he does say that "apparent horizons" could exist, meaning that light technically could escape from the deep gravitational pull of a black hole. Put simply, an apparent horizon would only temporarily hold light and information, eventually releasing them back into space.

Though, "eventually" is a pretty relative term when we're discussing the nature of spacetime.

"The picture Hawking gives sounds reasonable," Don Page, a physicist and expert on black holes at the University of Alberta in Edmonton, Canada told Nature. "You could say that it is radical to propose there's no event horizon. But these are highly quantum conditions, and there's ambiguity about what space-time even is, let alone whether there is a definite region that can be marked as an event horizon."

Still, that doesn't mean astronauts will be lining up to dive into a black hole anytime soon. As Nature puts it, an apparent horizon wouldn't burn you to a crisp like an Event Horizon would but it wouldn't leave you in "good shape" either. Any information or object escaping from a black hole in this scenario would be "pretty scrambled" in Hawking's own words.

#### PUBLIC NIGHTS AT MCAO:

10-Feb.-2014	Hank Bouchelle	Luck, fate and the death of Astrology.
24-Feb.-2014	Jack Fisher	Earth's orbital changes and climate change.
10-Mar.-2014	Don Wilson	Exploring the Universe
24-Mar.-2014	Greg Lee	Viewing upcoming Solar and Lunar eclipses.

**MCAG MISSION STATEMENT:**

**The Mission of the Mt. Cuba Astronomy Group is to increase knowledge and expand awareness of the science of astronomy and related technologies.**

**To provide MCAG members and the general public with monthly educational programs in astronomy and astronomy-related topics**

**To engage in outreach to the public as well as MCAG members to provide engaging and informational activities of astronomical interest, including public lectures and observing.**

**To support a responsive, informative, and useful newsletter for its members and the general public.**

**To support educational institutions, including schools and their teachers, in their efforts to engage and inform their stakeholders in the area of astronomy, formally and informally, and as appropriate its relationship to mathematics.**

**To hold formal and informal courses, work-shops, and retreats that support its members' interests, and engage and inform the general public.**

**To offer publications and materials of astronomical interest to its members at a discount as they may be available, and to the general public when possible.**

**To develop and support affiliations with like-minded institutions.**

If you know of anyone who is interested in Astronomy or someone who would like to learn more, please do not hesitate to extend an invitation to them to attend our meetings. If they have an interest in joining, our application is below.

## Mt. Cuba Astronomy Group

### *Membership Form*

The Mt. Cuba Astronomy Group is a tax-exempt organization dedicated to astronomy education and public outreach. Benefits of membership include:

- Monthly newsletter that includes details about the Group's activities and much astronomical information
- Monthly programs on subjects and topics of astronomical interest
- Free or discounted subscriptions to astronomy-related publications
- Free registration for MCAG workshops and classes
- Mention Mt. Cuba Astronomy Group and receive a 5% discount at Manor Books in New Castle (<http://www.yelp.com/biz/manor-used-books-New Castle>)



*Mail to:*

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Wilmington, DE 19810

Name \_\_\_\_\_

Name(s) (children, if any, and age): \_\_\_\_\_

E-mail address: \_\_\_\_\_

Home address: \_\_\_\_\_

Phone (optional): \_\_\_\_\_