Peterborough Astronomical Association

The Reflector

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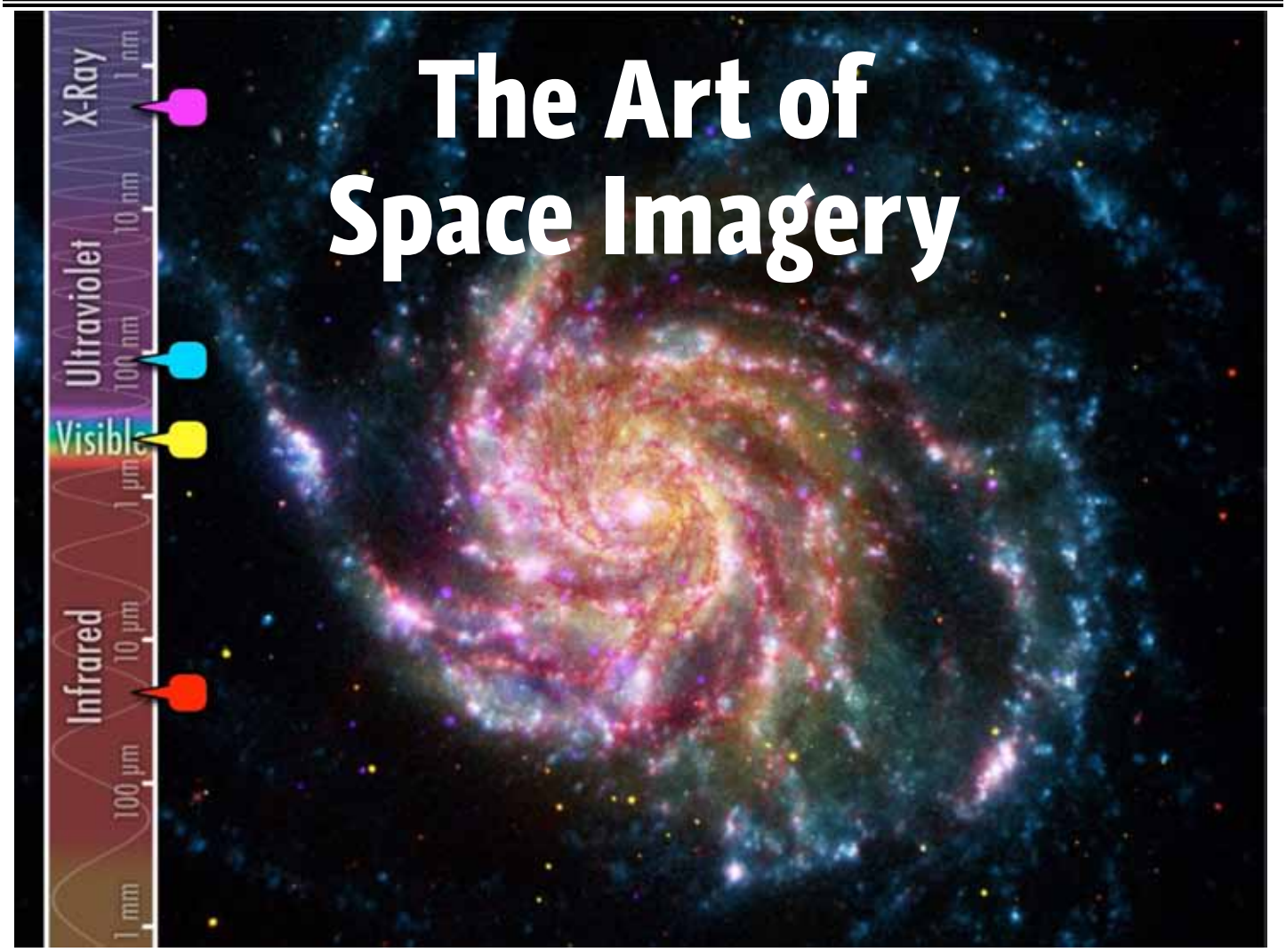

This image of M101 combines images from four different telescopes, each detecting a different part of the spectrum. Red indicates infrared information from Spitzer's 24-micron detector, and shows the cool dust in the galaxy. Yellow shows the visible starlight from the Hubble telescope. Cyan is ultraviolet light from the Galaxy Evolution Explorer space telescope, which shows the hottest and youngest stars. And magenta is X-ray energy detected by the Chandra X-ray Observatory, indicating incredibly hot activity, like accretion around black holes.

by Diane K. Fisher

When you see spectacular space images taken in infrared light by the Spitzer Space Telescope and other non-visible-light telescopes, you may wonder where those beautiful colors came from? After all, if the telescopes were recording infrared or ultraviolet light, we wouldn't see anything at all. So are the images "colorized" or "false colored"?

No, not really. The colors are translated. Just as a foreign language can be translated into our native language, an image made with light that falls outside the range of our seeing can be "translated" into colors we can see. Scientists process these images so they can not only see them, but they can also tease out all sorts of information the light can reveal. For example, wisely done color translation can reveal relative temperatures of stars, dust, and gas in the images, and show fine structural details of galaxies and nebulae.

Spitzer's Infrared Array Camera (IRAC), for example, is a four-channel camera, meaning that it has four different detector arrays, each measur-

see "Space Art" on page 16

President's Message

Monthly Meeting Agendas

Your executive met in January to formulate plans for the coming year with an emphasis on our monthly meetings. Some of the items discussed came from the membership survey that was completed a couple of years ago. This includes getting back-to-basics, the night sky and astrophotography. We plan to have a "monthly sky presentation," a what to look for in any given month. We will do practical astrophotography presentations at meetings, at member observing sites and even at public events such as Astronomy on the Hill. We hope that we can generate new interest in the meetings and get more members out.

On the news front, John Crossen will be presenting a series of articles for *The Reflector* highlighting member's observatories. These will include observatory descriptions, photos and equipment available at each site. Nutwood Observatory is featured this month. We're hoping this will generate astronomical interest in getting more members out to the observing sessions.

Don't forget it is membership renewal time. We plan to conduct a membership renewal drive to remind people of the benefits of membership.

Rodger Forsyth
PAA President

Letter from the Editor

Onward and Upward

We have a plethora of goodies this month. John Crossen begins a new series profiling the observatories of PAA members. His first story is about Brian McGaffney's Nutwood Observatory. Brian has also submitted a great HST-coloured image of M16. We look forward to reading about the other observatories in the coming months. So, book your calendar and pay them a visit this year. Membership has its privileges.

First-time contributor, Kenneth Sunderland, shares a page from his observing notebook. His study of the Jovian moons is very insightful as he follows in Galileo's footsteps.

Rick Stankiewicz, being Rick, has more photos to awe us and another book review. He also gives us another Citizen Science project, **Globe At Night**. John Crossen debunks the aliens visiting Earth and Mars tales. So, happy reading.

Phillip Chee
Editor, The Reflector

Peterborough Astronomical Association

The Reflector is a publication of the Peterborough Astronomical Association (P.A.A.) Founded in 1970, the P.A.A. is your local group for astronomy in Peterborough and the Kawarthas.
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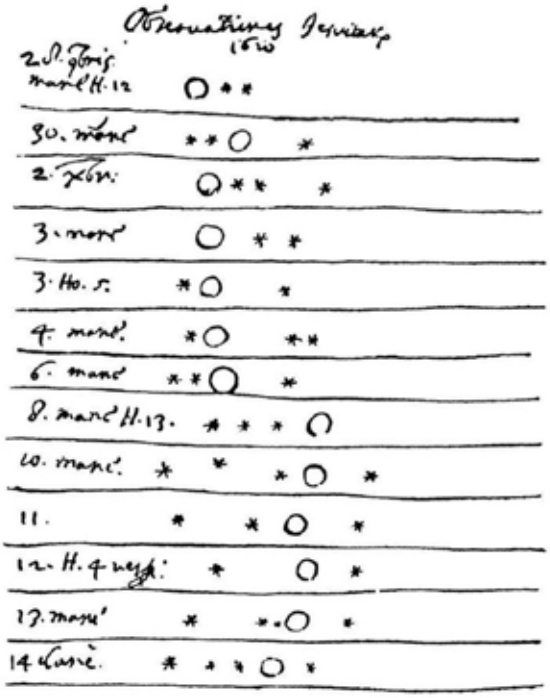
Starting out ...

Kenneth Sunderland

The purpose of this article is to share my experience making observations of the Galilean moons. Why? Because it's fun to share "Ah-ha!" moments with others who will understand. Perhaps it may even lend encouragement to the newest PAA members who, like me, are just starting out. How can/should someone new to astronomy begin to develop their observational skills? My answer was to try and reproduce what it was Galileo first sketched so many years ago that famously diminished Earth's special status. Here is a sketch from his notebook:



Source: Google

Observing the Jovian moons is historically significant and they are easily seen with good binoculars. For this project I am using a very modest refractor operating at 16× or 40× magnification. Presently, Jupiter is an easy target blazing high in the winter sky every night and brighter than any star. My "observatory" is a backyard in light-polluted Peterborough but, no matter, Jupiter and moons cut through the glow. I frankly didn't expect to learn much from the whole exercise. I was pleasantly surprised.

In an article on astronomical sketching in the *2013 Observer's Handbook,* Kathleen Houston observes, "Pencil-to-paper is an active, energy-shifting experience that allows one to see more, to go beyond the casual ten-second glance through a telescope at a public star party." Yes. Yes!

Below (Figure 1.) is a sample page from my sketchbook.

What have I learned so far? Here is a sampling;

a. I see what Galileo saw! That which was simply accepted as true for so many years has now been confirmed with my own eyes. Jupiter and its moons are a solar system analogue. Earth with its moon is not unique—there are other worlds! *Mirabile dictu.*
b. A single look gives a snapshot or a static view. Of course, this is interesting by itself, but there is another view—the dynamical view. This view rewards those who are patient enough to observe through time. We see the dynamical view in Galileo's sequence of sketches. My sketchbook shows that I too am beginning to get a feel for the orbital dynamics, but it takes time.
c. It is difficult to estimate the distance from Jupiter to each moon. Through the eyepiece I estimate the distance in Jupiter diameters. (e.g. it looks like 2 Jupiter's will fit in that space to the nearest moon.) Another method is comparing one orbital radius to another. (e.g. that distance is about 4× the smaller orbit.) This, no doubt, all sounds rather hopeless. However, with practice, I am now surprising myself with proportionally correct

See "Jovian Moons" on page 11

Nutwood Observatory

John Crossen

The PAA is fortunate to have six member-owned observatories available to the club. Over the next few issues of *The Reflector* we'll explore each of them and I think you will be amazed at the level of professionalism with which they are outfitted and operated.

First on our list is the 2,000-acre Nutwood Observatory and wildlife sanctuary.

The facility is an astronomer's paradise with built-in observing pads for your telescope, running water and washrooms—yes ladies, washrooms. Just add you and a telescope to complete the picture.

If you enjoy hiking and nature trails, you can wander to your heart's content during the day. Chances are you'll meet up with a friendly herd of elk who call Nutwood their home as do a variety of wild birds and smaller critters.

Elk at Nutwood Observatory. Astronomers aren't the only residents at Nutwood Observatory.

Club Member Brian McGaffney owns the property and encourages PAA members to visit anytime there's a clear night. During the summer he is open to camping and gives regular sky tours at his 12 × 12-foot guest observatory. There you'll scan the sky through Brian's 16-inch Sky-Watcher computerized Go-To scope, or perhaps through his binocular-equipped refractor. For those with an interest in astro-imaging Brian has a 16-foot motorized dome in which a 14-inch Ceravolo Astrograph resides along with a host of computers and monitors for image processing as well.

Brian up ladder with 16-inch SkyWatcher. Visitors enjoy stunning views through Brian's 16-inch light-bucket.

Brian has been an avid science buff and astro-nerd since building his first telescope in grade six. Today he holds a PhD in physics, consults with a computer manufacturing facility in North Bay (which he used to own) and teaches astro-imaging as well as computer science in Canada and the U.S.

See "Nutwood" on page 15

Citizen Science
Globe At Night

Rick Stankiewicz

After last month's article, I hope I piqued your interest in the area of citizen science. Yes, that means you. You can be as active or not as you wish. The program I wish to fill you in on this month is **Globe at Night**. I have participated every year for sometime now and it is really easy and quite painless. Start by checking out the following link: `www.globeatnight.org`.

By the time you read this article the first session in 2013 will be opened for the window of opportunity to participate. From January 31st to February 9th data is being collected for any area you choose. Even your backyard is a possibility. There are five easy steps to find stars, record data and submit it: 1) Start by finding your latitude and longitude. 2) Find the constellation of Orion or Leo more than an hour after sunset. 3) Match your star view of the night sky with one of the websites star magnitude charts. 4) Report your observation on-line. 5) Compare your observation with over 1,753 made to date and help the organization reach its goal of over 15,000 observations around the world this year.

Be a citizen science and help our planet in some small way. What good does this do you ask? By reporting year after year, you help build up the database and this will assist in monitoring the effect of light pollution on our night skies.

Consider making your contribution to science without having to donate an arm or a leg, just your time and careful consideration. Why not join me in the lab.

Close Call

Rick Stankiewicz

The night of January 21st was another close call. If you braved the cold (-18 °C) this particular evening you would have been treated to a memorable close conjunction of a waxing gibbous Moon (ten days old) and the gas giant, Jupiter (Figure 1.) Jupiter

Figure 1. Jupiter image, (cropped) Canon 400D, Sigma 70-300mm lens at 300mm, tripod mounted Vixen Polarie, ISO 400, f/5.6, 1/400 sec.

appeared to have less than ¾ degrees of angular separation from the Moon. This does not happen that often and it might be until 2026 that you get another chance. Last month there was a similar conjunction, but even then there was about a 2 degree separation. If you had been in the southern hemisphere on the 21st you could have possibly seen an occultation of Jupiter by the lunar disk. We were doing well to see an event of less than 1 degree. Note the upper terminator (shadow edge) on the Moon and the dramatic lighting that highlights the huge crater of Sinus Iridium (Bay of Rainbows, which is the size of Kentucky) off the Sea of Rains (Mare Imbrium). It stands out so nicely.

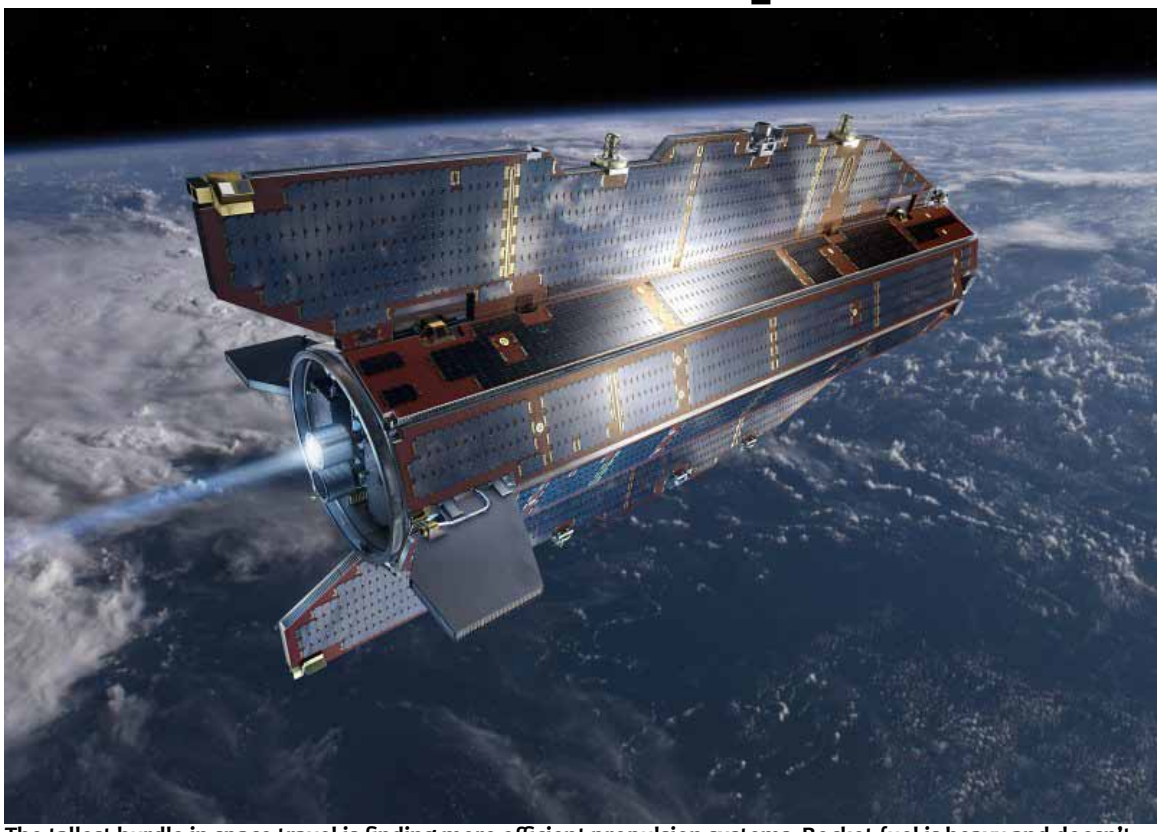
Not only was the fact that a clear night during this event made for a memorable experience (been so cloudy lately), but Jupiter's recent "sky buddy", Aldebaran (Alpha Tauri) was just only about 3 degrees to the left of the Moon (Figure 2.)

Figure 1. Moon-Aldebaran-Jupiter (cropped) Canon 400D, Sigma 70-300mm lens at 149mm, tripod mounted Vixen Polarie, ISO 400, f/4.5, 1 sec.

This made for a pretty special grouping. And when you consider that just a pair of binoculars helped reveal three moons of Jupiter, you had a wonderful grouping of seven celestial bodies in one field of view. My last image shows a cropped view of what I captured with just a telephoto lense showing Jupiter and its four moons. Ganymede to the upper left of the over exposed Jovian disk, Io over Europa and then Callisto to the lower right. The glow to the left in this image is the Moon's bright surface illuminating the haze that filtered the sky and the object directly below Jupiter is a star. This time of year can have its observing challenges, for example, my finger tips were freezing after just a few minutes with only thin wool gloves on, but it can be worth it. You be the judge.

Figure 3. Jupiter and its moons (cropped) Canon 400D, Sigma 70-300mm lens at 300mm, tripod mounted Vixen Polarie, ISO 400, f/5.6, 1 sec.

Is Mars Mankind's Next Giant Leap?



The tallest hurdle in space travel is finding more efficient propulsion systems. Rocket fuel is heavy and doesn't deliver the necessary speed to make travel in our solar system feasible. Right now it takes nine years to get to Pluto. Ion and plasma engines may be the answers

John Crossen

If NASA's interest in extended space travel is any indication, I'd say yes. The rovers Spirit and Opportunity along with the Phoenix Lander succeeded in providing ample evidence that water once flowed on Mars.

On January 20th the Mars Reconnaissance Orbiter (MRO) also confirmed the ancient water theory via spectrometer of a now-dried-up lakebed. The lake, which was once 1.4 kilometres deep, was fed by underground water.

NASA is also stepping up the emphasis on human survival during a year-long spaceflight. Aside from folks just plain getting cranky when confined to the relatively claustrophobic quarters of a spacecraft, there are several other factors to factor in.

Loss of muscle strength and bone marrow are two critical considerations. Previous astronauts and cosmonauts have returned to Earth in slightly degraded form after long-term treks in micro-gravity.

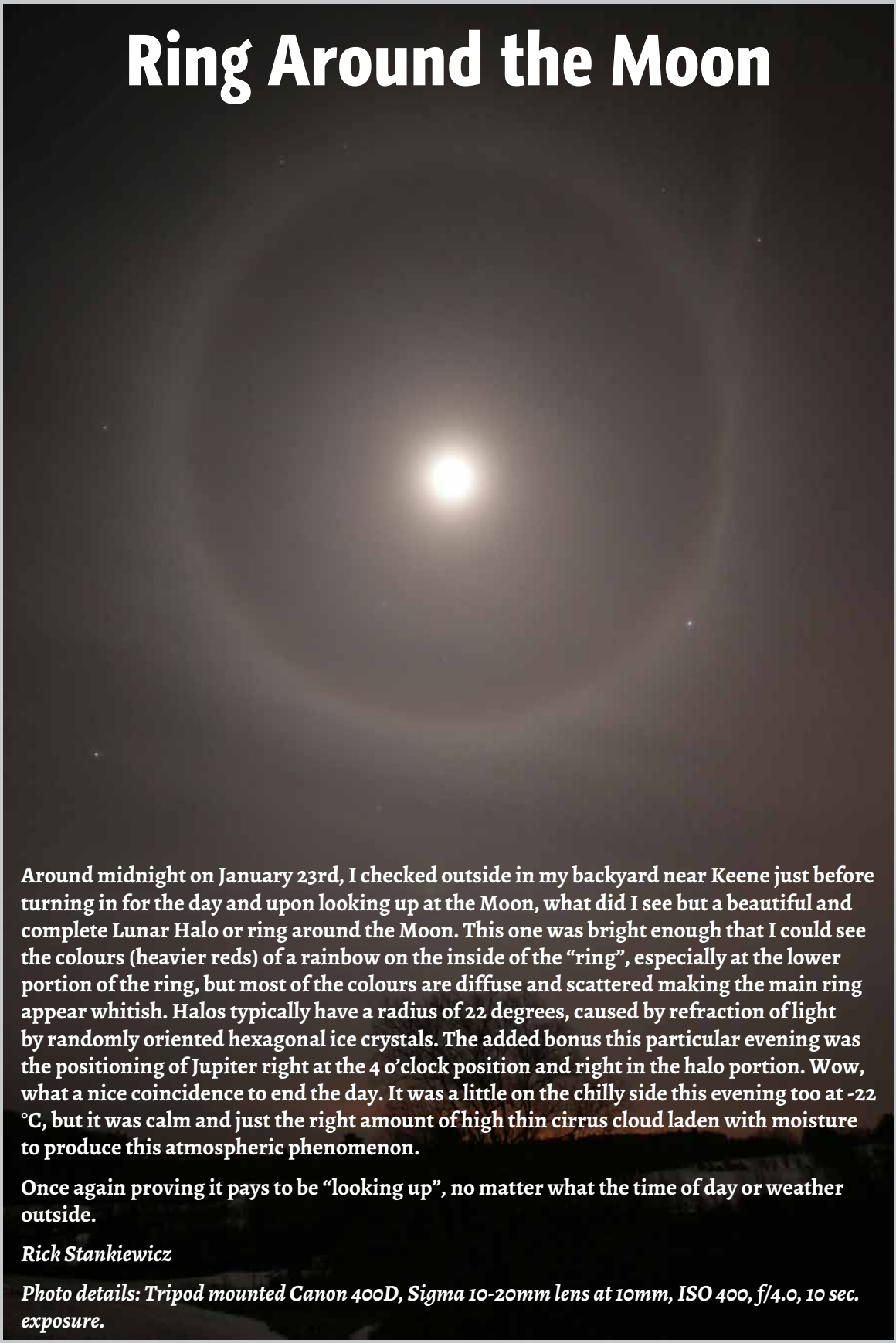
One of the Mir cosmonauts lost so much muscle strength after a year in the micro gravity of low-Earth-orbit that he couldn't stand up when he returned to Earth. Imagine arriving on Mars after a year in space only to fall over while stepping off your spacecraft.

Loss of muscle strength is a priority that may be solved by incorporating

See "Mars Mission" on page 14

PHOTO GALLERY

Ring Around the Moon



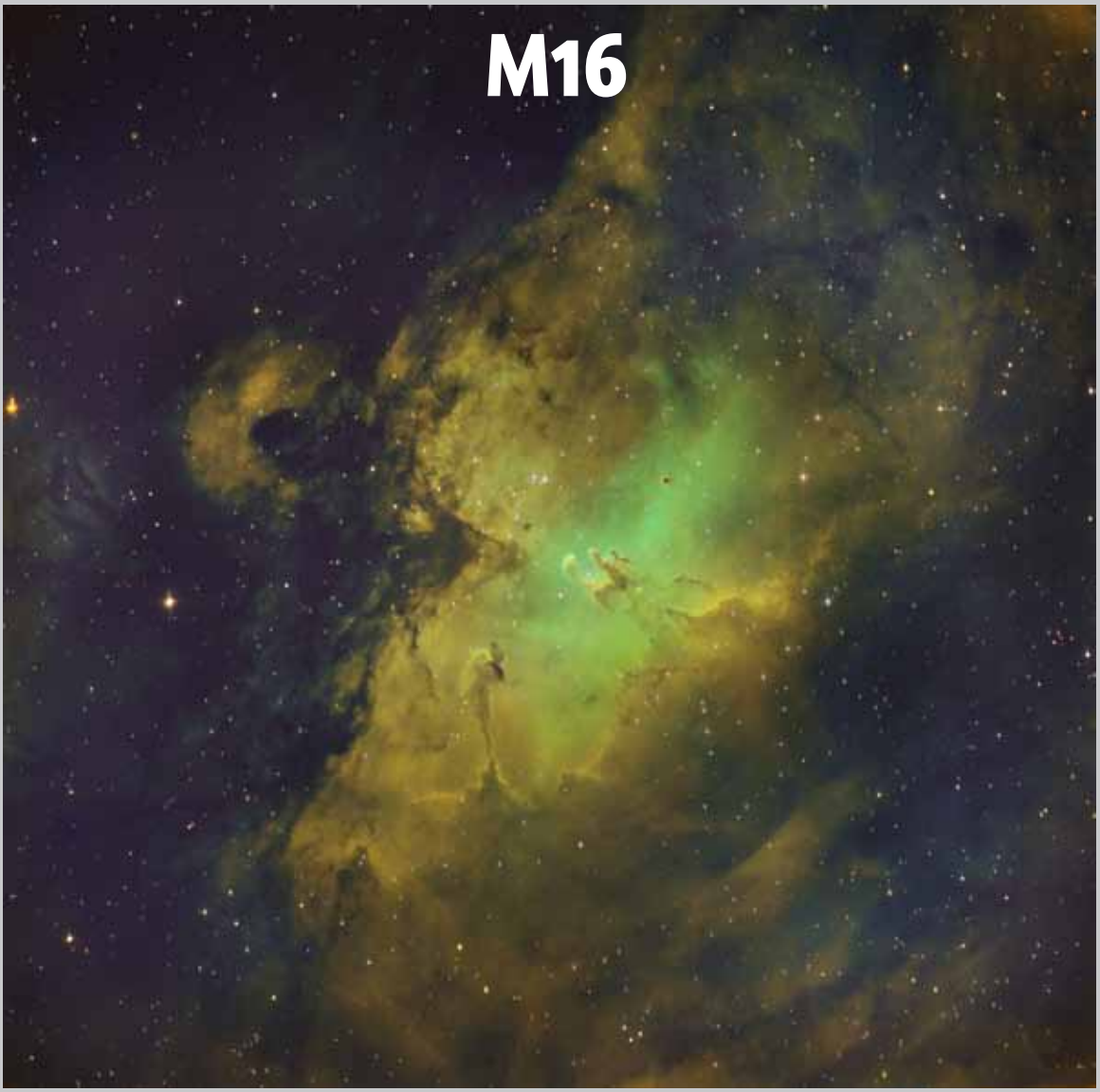
Around midnight on January 23rd, I checked outside in my backyard near Keene just before turning in for the day and upon looking up at the Moon, what did I see but a beautiful and complete Lunar Halo or ring around the Moon. This one was bright enough that I could see the colours (heavier reds) of a rainbow on the inside of the "ring", especially at the lower portion of the ring, but most of the colours are diffuse and scattered making the main ring appear whitish. Halos typically have a radius of 22 degrees, caused by refraction of light by randomly oriented hexagonal ice crystals. The added bonus this particular evening was the positioning of Jupiter right at the 4 o'clock position and right in the halo portion. Wow, what a nice coincidence to end the day. It was a little on the chilly side this evening too at -22 °C, but it was calm and just the right amount of high thin cirrus cloud laden with moisture to produce this atmospheric phenomenon.

Once again proving it pays to be "looking up", no matter what the time of day or weather outside.

Rick Stankiewicz

Photo details: Tripod mounted Canon 400D, Sigma 10-20mm lens at 10mm, ISO 400, f/4.0, 10 sec. exposure.

M16

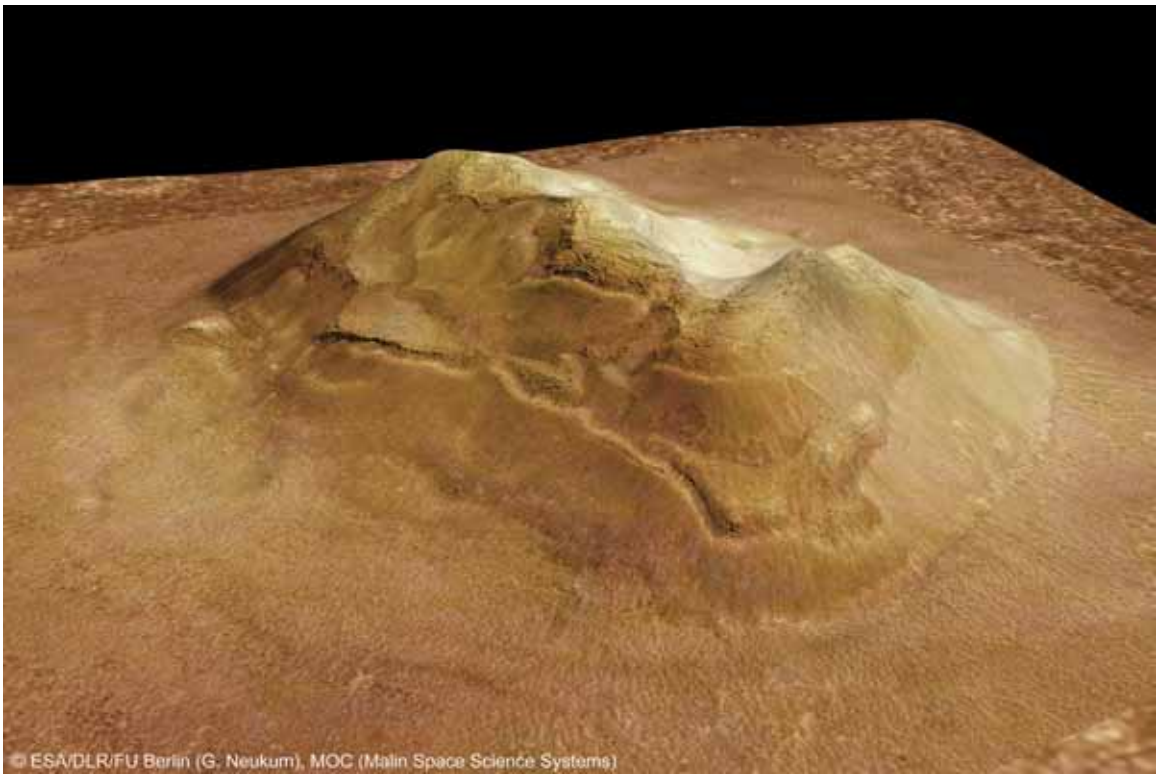


I am enclosing a CCD image done here at the observatory in around Sept 15th of 2012. The plan here was to come close to a previous Hubble image of the Pillars of Creation. So I used a special camera that can be used to display a hi-res image close up when expanded. Basically this image of M16 (the Eagle Nebula) was done in HST (Hubble Space Telescope) palette. It is a false colour but sensitive to Hα, OIII, SII, just the way the Hubble made the shot a few years back, replacing the RGB respectively with the Hα, OII and SII wavelengths. The equipment used was a 14-inch carbon truss astrograph with narrow band filters and with a liquid cooled Apogee CCD camera where the pixel size was 4.7µm per pixel. Base image is done here at Bin 1, enough to allow the enclosed inset to be made with some detail. It's not the Hubble, but fairly good for dark skies of central Ontario.

Thes two images were converted to 8-bit jpegs, but the 32-bit images are available.

Brian McGaffney

Ancient Alien Civilizations on Earth and Mars



John Crossen

I'm a sceptic. There seem to be too many people who want to believe some concept that defies rational belief. The phrase "want to believe" is the key here. If you want to believe something you will, for whatever reason.

Perhaps you want to give the impression of being a "far out" thinker. I have a friend like that. She's drawn to weird ideas like cops to a doughnut factory, simply because they sound mysterious. We live in an age that champions unconventional thinkers. But it also encourages some fairly eerie theory panhandling.

Einstein was considered an unconventional thinker. Some of the best minds in physics, such as Niels Bohr, challenged him. But Einstein's concepts have proven themselves to be correct. Gravity really does bend light. Time actually does slow down as speed increases. They're all weird to the logical minds of most people—including me.

But there are some current ideas that just don't cut the mustard. One of my favourites is the idea that we and the Martians have been visited by aliens who taught us their skills and left behind monuments.

The most famous is "the face on Mars" photograph. It was taken in 1976 by the Viking spacecraft. One look and it appears to be a face. It became a pop culture icon with a Hollywood movie, and countless grocery store scandal rags to its credit. But the face disappears when the lighting and seasons on Mars change.

Fast forward to 2013. With thousands of Mars photographs from eight years of rover and orbiter shots to choose from we have a fresh battalion of inspired thinkers who have examined the images and claim to see a Martian gorilla, Egyptian towers, a mother and child as well as flowers and some sort of dragon.

Hmm, flowers on a planet with average temperatures well below zero degrees

see "Aliens" on pae 13

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Jovian Moons

sketches. One is rewarded for time spent at the eyepiece by slowly beginning to see more accurately.

d. It has been challenging to sort out which moon is which and in what direction it is moving. Monthly charts giving their positions have been an essential aide. A full description would deserve its own article.

e. As the moons move in their orbits they often approximate four points on a straight line—a sort of sky "ruler". Certainly Galileo's sketches strongly suggest it. From Jupiter's rising until it sets, this "ruler" points along the arc of the ecliptic ... at least that's what I think. Spherical shapes moving across the sky do not suggest the direction of the arc as forcibly as a pointing "ruler". If I am right, when Jupiter transits (i.e. crosses my meridian), the "ruler" of moons should be more or less parallel to the horizon. So, here is an example of how an observational program gets started and sustains itself. I wasn't even aware of the changing direction of the line formed by the Galilean moons until making sketches at different times. That posed the question "why?" in my mind. I've invented a dynamical model to fit the facts and from which predictions can be made. (e.g. parallel transit prediction) Since it can only be tested by looking, now I'm excited for the next clear night!

The point of this article was to share some early personal discoveries about Jupiter's moons. To be sure, it has all been seen before, but there is no denying a delight and deeper understanding when realized in person for the very first time. "Ah-ha!" indeed. I especially wanted to let the other newest members know how this newest member is getting started in this absorbing hobby. Surely observing Jovian moons is considered a straight-forward beginner's project, making it all the more pleasing to discover how much can be learned with basic equipment and a discerning eye. It's a start.

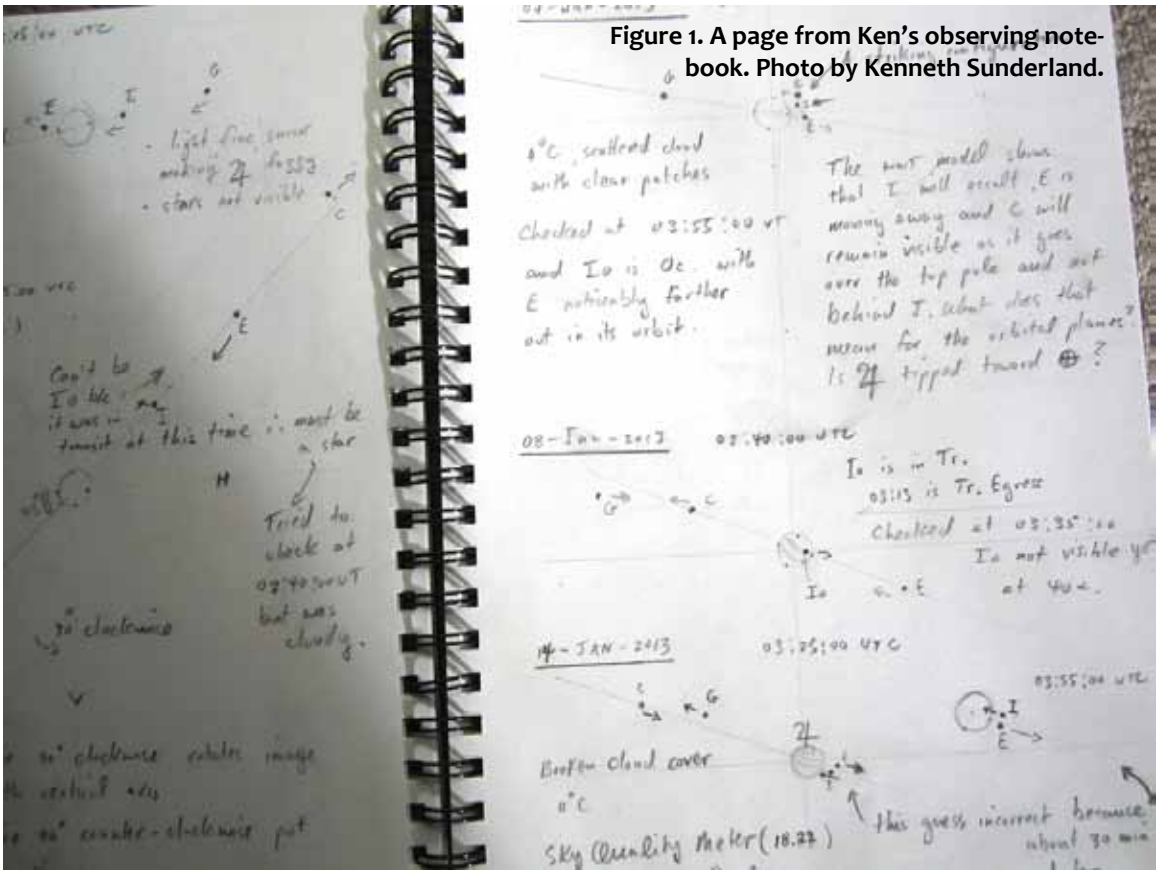
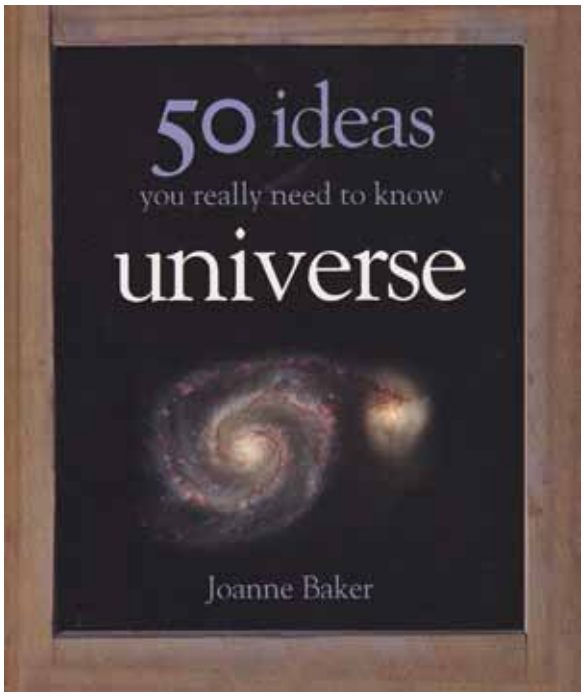


Figure 1. A page from Ken's observing notebook. Photo by Kenneth Sunderland.

BOOK REVIEW

50 Ideas You Really Need to Know: Universe



Rick Stankiewicz

It is surprising what you can pick-up on the discount rack at Chapter's. This is where I found this title I am reviewing here. The premise of "50 Ideas" is that each of the fifty topics covered is done so in only four pages each. Given the cross-section of topics, this brevity is a challenge to say the least. I would descibe this book as a "Cole's Notes of the Universe." The author for the most part hits the mark, but as you can appreciate, four pages are not quite adequate when trying to explain the "string theory." Bless her heart for trying though. This book is still a good quick reference or refresher for many topics. The fifty subjects are grouped into five categories from Revealing The Universe, to Cosmology, to Space-time And Beyond, to Galaxies and finally Stars. This is a format that works, with a "timeline" of important events related to each topic across the bottom of the first two pages and throughout, a few selected quotes by famous people to spice things up. One of my favourites was Carl Sagan's, "In order to make an apple pie from scratch, you must first create the universe."

The illustrations are used sparingly, but are always a welcomed addition. If a picture is worth a thousand words then maybe this is how the author pulled off such a condensed book. I have to give credit to the author for attempting to cover such a broad suite of astronomical topics in just 208 small pages, a good primer at least and I am appreciative of it.

50 Ideas You Really Need to Know: Universe. **Joanne Baker. Quercus Publishing Plc. 2011. 208 Pages. ISBN-13: 978-0857381231**

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Aliens

centigrade? Gorillas and dragons romping around on a frigid planet with virtually no atmosphere? One photograph of something that looks like Egyptian architecture? I'd like to see more images of the same subjects from different angles before coming to such hasty conclusions. But again, if you want to believe, you will believe.

Ditto goes for technological gifts from visits by advanced civilizations. The Egyptians had barges for transporting the mammoth stones of the pyramids and dug canals to the building sites. Copper saws using sand — Egypt has lots of sand — as an abrasive agent is how cuts were very slowly made. Egyptians also had wooden tools for measuring and cutting very precise angles.

Cut to the temples of Pumapunku and the same applies. The technology already existed in previous cultures on Earth — the Greek temples for instance. Plus the nearly-impossible-to-cut diorite and granite as claimed are actually red sandstone.

How did the massive stones get up to Pumapunku? A short trip down to the tree line reveals a great source of rolling logs. Did the facts slipped past our New Age experts? Check out "Ancient Aliens Debunked" on YouTube. Then you decide.

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Mars Mission

an artificial gravity device such as a spinning room aboard the ISS. The spinning motion would generate artificial gravity, like the spacecraft in the movie 2001. The idea certainly is getting attention from the NASA scientists.

More astronauts are also spending extended tours of duty aboard the ISS to find solutions to long-term micro-gravity environments. ISS Commander Chris Hadfield is just one example. His experience in micro-gravity has made him an expert in bone degeneration and he frequently gives talks to groups on the subject of osteoporosis. Commander Hadfield's current tour of duty will be five months.

Outer space isn't necessarily empty space. Particles of debris from ancient asteroid collisions, melting comets and the very formation of our solar system are still floating about. Some are travelling at great speeds and could penetrate the hull of a space craft. Plus the spacecraft will be travelling at thousands of kilometres per hour. Colliding with even a pebble-sized object at those speeds could spell doom to our Mars crew.

Armour plating is too heavy, so NASA is exploring a sandwiched type of shell for the spacecraft's hull. Made of multiple layers of foam-like material it is lightweight and has survived several high-speed hits. It captures the impacting material between the foam-like layers, thereby preventing it from penetrating the ship's hull.

From cosmic rays to food storage and more, there is much to be learned. But technology moves faster than the imagination. Who knows, we may re-engineer ourselves into robo-noids to survive the rigors of such a journey.

The Sky this Month

Mercury is well placed for evening apparition this month. Reaches greatest elongation East (18°) on the 16th. Passes 0.3° N of Mars on the 8th and 5° S of the waxing crescent Moon on the 11th.

Venus is very low in the eastern morning sky as it approaches superior conjunction. Disappears into the morning twilight by month-end.

Mars low in West-South-West evening twilight sky and moves eastward through Aquarius. Disappears into twilight glare by mid-month and reappears in June.

Jupiter well placed in the evening sky northof the Hyades. Completes retrograde loop on the 30th.

Saturn in Libra rising near midnight. Begins retrrograde motion on the 19th.

Zodiacal Light visible in west after evening twilight for two weeks from the 27th.

Quadrantid meteors peak at 8 a.m. on the 3rd.

Moon Phases

Last Quarter	**8:56AM**	**February 3**
New Moon	**2:20 AM**	**February 10**
First Quater	**3:31 PM**	**February 17**
Full Moon	**3:26 PM**	**February 25**

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Nutwood

Brian's images have frequently appeared in the Journal of the Royal Astronomical Society of Canada and are recognized as being some of the finest taken by Canadians.

Nutwood Observatory welcomes PAA member visits, just give Brian a call at 613-332-3885. There will also be a PAA observing session there on September 13 and 14 of 2013. The grounds are located 15 minutes from Bancroft, Ontario. That makes it about an hour's drive north of Peterborough.

To take a cyber tour of the facility visit www.nutwood-observatory.com. Be sure to check out the gallery of Brian's work. I think you'll be amazed on all counts.

14-INCH CERAVOLO IN DOME. The 16-foot dome is home to a 14-inch Ceravolo astrograph and all the electronic gear necessary to take superb astro-images.

One thing that you'll have to see in person to appreciate is the dark sky available to astronomers at Nutwood Observatory. The rating on the Sky Quality Meter (SQM) is 21.0 and that's about as good as it gets anywhere.

M1. Imaged by Brian nearly 1,000 years after a Super Nova created it in 1054, the Crab Nebula (Messier #1) is seen in stunning detail in this photo.

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Space Art

ing light at one particular wavelength. Each image from each detector array resembles a grayscale image, because the entire detector-array is responding to only one wavelength of light. However, the relative brightness will vary across the array.

So, starting with one detector array, the first step is to determine what is the brightest thing and the darkest thing in the image. Software is used to pick out this dynamic range and to re-compute the value of each pixel. This process produces a grey-scale image. At the end of this process, for Spitzer, we will have four grayscale images, one for each for the four IRAC detectors.

Matter of different temperatures emit different wavelengths of light. A cool object emits longer wavelengths (lower energies) of light than a warmer object. So, for each scene, we will see four grayscale images, each of them different.

Normally, the three primary colors are assigned to these gray-scale images based on the order they appear in the spectrum, with blue assigned to the shortest wavelength, and red to the longest. In the case of Spitzer, with four wavelengths to represent, a secondary color is chosen, such as yellow. So images that combine all four of the IRAC's infrared detectors are remapped into red, yellow, green, and blue wavelengths in the visible part of the spectrum.

Download a new Spitzer poster of the center of the Milky Way. On the back is a more complete and colorfully-illustrated explanation of the "art of space imagery." Go to spaceplace.nasa.gov/posters/#milky-way.

Go to http://saturn.jpl.nasa.gov/ to read about the latest Cassini discoveries. For kids, The Space Place has lots of ways to explore Saturn at http://spaceplace.nasa.gov/search/cassini/.

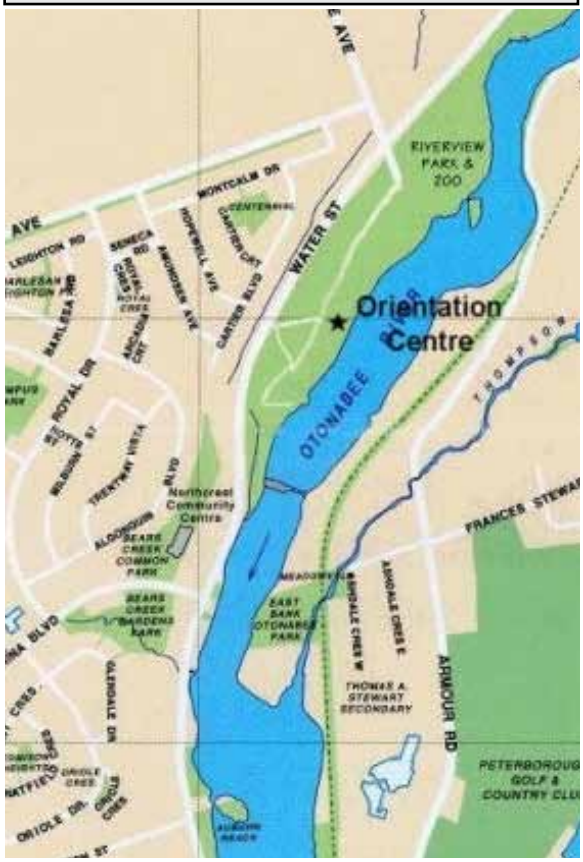
This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Articles

Submissions for *The Reflector* must be received by the date listed below. E-mail submissions are preferred (Microsoft Word, OpenDoc, ASCII and most common graphic formats are acceptable). If your article contains photso or graphics, please provide a separate file for each. Typed or handwritten submissions are acceptable provided they are legible (and not too long.) Copyrighted materials will not be published without written permission from the copyright holder. Submissions may be edited for grammar, brevity, or clarity. Submissions will be published at the editor's sole discretion. Depending on the volume of submissions, some articles may be published at a later date. Please submit any articles, thoughts, or ideas to:

phillip.chee@gmail.com

NEXT SUBMISSION DEADLINE:
FEBRUARY 25, 2013



Meetings

The Peterborough Astronomical Association meets every first Friday of most months at the **Peterborough Zoo Orientation Centre** (Next to the PUC Water Treatment Plant) at 8 p.m. P.A.A. executive business will be conducted starting at 7:30 p.m. Members and the public are welcome to attend the earlier time.