# event Horizon

#### Volume 24, Number 2 December 2016

#### From The Editor

Our year-ending E.H. for 2016 has lots of goodies for the holiday season.

Once again, thanks to all article & image contributors.

Clear Skies!

Bob Christmas, Editor

editor 'AT' amateurastronomy.org

#### Chair's Report by Bernie Venasse

The November Scope Clinic was a great success with attendance exceeding expectations. Donations for the Food Bank were as always well appreciated. Next November we must remember to avoid the Santa Clause Parade day !!

Harvey Garden has resigned from his position as a Councillor-at-Large. We appreciate his efforts and time that he gave to the council. His resignation opens a vacancy! If YOU have considered giving a bit of your time to the operation of the club this would be a great opportunity to get your feet wet.

CALENDARS.... Are available from 'THE BACK TABLE'... They are also available from Chris White at the URBAN ZOO PET SHOP, 620 Upper James St in Hamilton and also from Brian and Shannon at KW Telescope-Perceptor at 25 Manitou Drive in Kitchener. Drop by either of these locations, say hello and get your copy of the calendar.

Dear Santa,

Would it be too much to ask for a clear and calm night on the weekend????

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# Hamilton Amateur Astronomers 2017 Celestial Events Calendar



The HAA 2017 Celestial Events Calendar is now available for sale. This beautiful calendar features images exclusively by your fellow HAA members. They make wonderful gifts and look great when displayed at home or office.

The price is \$15 each or two for \$25.

Any revenue generated from sales goes back into the club to help support club activities.

#### H.A.A.'s Loaner Scope Program



We at the HAA are proud of our Loaner Scope Program.

If you don't have a telescope of your own and want to make use of one for a month or so, you can borrow one of our fine loaner scopes.

Please contact Jim Wamsley, at 905-627-4323, or e-mail Jim at:

secretary 'AT' amateurastronomy.org

and we'll gladly get one signed out for you.

#### HAA Helps Hamilton



To support our community, we collect nonperishable food items and cash for local food banks at our general meetings. Please bring a nonperishable food

item to the meeting or a donation of cash and help us help others.



Our donations go to <u>Hamilton Food Share</u>, which delivers them to various food banks around the Hamilton area.

If you would like to help or have any questions about this initiative, please contact the H.A.A.

Masthead Photo: The Ring Nebula (M57), by David Tym.

Canon 6D, LDAS LPS-D1, auto-guided. Taken November 7, 2016. Exposures: 16 x 5 minutes; 80 minutes total.

# The November 2016 general meeting of the HAA by Matthew Mannering

Following Bernie Venasse's opening remarks, our Education Director John Gauvreau gave a short synopsis of his activities over the last year. John made approximately 20 presentations of which ½ were at Libraries and the rest were split between Churches, Brownies and BASEF. Some programmes were for youth and others for adults. They were all beginners. Thanks to Jim W., Don P., Les W., Steve G., Mario C., Bernie V., and Matthew M. who all came out at various times to help. Lastly, John mentioned that a 101 class would occur early next year.

The audience was told that the 2017 HAA Calendars are now for sale at the back desk. One for \$15 or two for \$25.

This month our guest speaker was *Brian Dernesch*, owner of KWTelescope in Kitchener. His daughter Shannon Cameron came along to help show off some of their products at the break. His talk was titled "Observing Tips; how to get the most out of your time under the sky". Here in point form are the main topics covered in his talk:

- Things overlooked; such as Laptop, SD cards, counterweights, cables, batteries and soft ground.
- I think I have one of those; catalogue your equipment so that you know when new toys are added to your collection, you have all of the small extra parts you need.
- Preparation
- **Evernote**; a free spreadsheet programme where you can log all of your equipment and include notes. ie. how stuff goes together and how to make it work.
- Know your location and requirements; trees, lights, wires, NCP visible, A/C power available, how cold, bug spray and food.
- Weather; know what's coming. Is it actually worth while to pack all of your equipment and go out in the first place? Use MyRadar app or the Weather Network for example.
- The Mathematics; know how Exit pupil, F-Ratio, Magnification and Focal length affect your observing for both visual and photography.
- Telescope/Eyepiece pairings; match them to the intended target for framing.
- Filter use; match exit pupil to filter and object types.
- **Observing list**; have one to know which objects are available and where and when to observe them during the session. Calsky.com can generate a list based on your location.

John Gauvreau announced that Barry Sherman has donated a 90mm refractor to the club and thanked him.

Steve Germann then presented his first "The sky this month" talk.

- Showed pictures by Bob Christmas of the California nebula and Barnard's "E" in Aquila.
- Mentioned that his aim is to encourage observing so;
- Talked about the variable star Mira which is currently getting brighter. Try to find it and track the change in brightness over the next couple of months.
- Look at the meteor showers starting with the Leonids which peak the night of Nov. 17/18.
- Handed out planispheres so that we can mark the location and direction of meteors that are observed.
- The 2017 eclipse and some sight-seeing you could do en-route.
- How Ad-hoc groups can be formed and supported by the club. How much interest is there and is the group sustainable. Present a short talk once a year to talk about topics covered and activities.
- November 20th, the Astrophysics group will start up at 2pm.

Bernie then closed the meeting.

# The Sky This Month for December 2016 by Steve Germann

#### Meteor Showers coming soon

The months of December and January are when the Earth's orbit intersects the streams of the 2 most numerous meteor showers of the year, the **Geminids**, peaking at midnight on December 13-14 and the **Quadrantids**, on January 2-3 with the peak just before dawn on January 3, 2017.

In both cases, an observer with good vision and an unobstructed view of the sky might see 2 meteors per minute, if the moon did not interfere. This time, the moon does indeed interfere with the Geminids, but the Quadrantids and **Ursids** are unimpaired. Due to interference with the moon, you will only see the brightest of the Geminids, but the flip side is you won't need to travel to darker skies.

You can practice with the Geminids, and after seeing a few, the Ursids and the Quadrantids will be easy as pie.

You can read about the Geminids in advance...

http://www.timeanddate.com/astronomy/meteor-shower/geminids.html

Don't forget the Ursid meteor shower. It will have a favourable moon aspect and they will peak just before sunrise on December 22.

http://www.timeanddate.com/astronomy/meteor-shower/ursids.html

The Geminids are associated with an 'asteroid', **3200 Phaethon** which takes about 1.4 years to orbit around the Sun. However, recent research is showing that it is more like an nearly extinct comet... because it has a dust tail, and has a cometary orbit. It was the first 'asteroid' to be discovered by a spacecraft.

Some trivia about 3200 Phaethon at this link: https://en.wikipedia.org/wiki/3200\_Phaethon

Rather than admit it's a comet, astronomers still want to call it a 'special' asteroid. So many battles over categories and names, it seems.

Another body with similar characteristics is 7968 Elst-Pizarro with some details here:

https://en.wikipedia.org/wiki/7968\_Elst%E2%80%93Pizarro

You won't spot those asteroids with your portable telescope, but you will easily spot a bunch of Geminid meteors on the evening of December 13th. If it is cloudy, then any nearby date will also yield a few meteors. Note their position on the sky and see if you can trace them back to the Geminid radiant, near the feet of Gemini, which is up all night.

#### Don't Miss...

#### (Times in Eastern Standard Time)

December 6, an occultation of Neptune by the Moon, at 7 PM our time. December 12-13 at midnight, and occultation of Aldebaran by the Moon, December 21, 5:44 AM, The Winter Solstice. From there on, it's all uphill. December 22, 2 PM, Jupiter 2 degrees south of the moon, a chance for a rare daytime view of Jupiter in Binoculars! (Continued on page 5)

#### Astronomy chatter

Venus continues to shine brightly in the evening sky. That will be what people ask you about.

#### Minor planet targets

As to minor planets in our field of view, it turns out it's not easy to search for them, using a computer and an area of interest in the sky... However, I found this interesting page about 'exceptional' asteroids, and I will take you through the steps to observe one for yourself. If you have a 8 inch or bigger telescope, the brightest ones will all be easy targets. In binoculars, you will need to wait for them to come to opposition.

#### https://en.wikipedia.org/wiki/List\_of\_exceptional\_asteroids

The asteroid still near opposition this month is **18 Melpomene** which is brighter than magnitude 9.5 all December. You should generate your own chart on the date of interest, using Heavens Above, so that it's accurate to your time of observing. There are plenty of stars brighter than it in the nearby star field, and you would not want to miss it.

#### Asteroid 18 Melpomene



But let's take a random 'exceptional' asteroid from the wiki page and follow it through. We can make our task much easier by sticking to the asteroids that we are likely to be able to observe. Thankfully, Heavens Above summarizes that for us:

#### Asteroids

This table shows the brightest currently observable asteroids. details, including finder charts.

Asteroid	Brightness	Altitude	Constellation
4 Vesta	7.3	36.6°	Cancer
1 Ceres	8.1	28.7°	Cetus
18 Melpomene	8.8	27.9°	Cetus
60 Echo	10.1	61.5°	Taurus
2 Pallas	10.3	-16.7°	Aquarius
15 Eunomia	10.3	5.7°	Sextans
79 Eurynome	10.3	44.7°	Cetus
22 Kalliope	10.5	61.5°	Gemini
9 Metis	10.6	11.0°	Leo
13 Egeria	10.6	51.7°	Lynx
11 Parthenope	10.7	13.5°	Pisces
14 Irene	10.7	15.6°	Leo
29 Amphitrite	10.8	2.3°	Leo
7 Iris	10.9	-59.7°	Sagittarius
10 Hygiea	10.9	-63.9°	Libra
68 Leto	11.0	67.2°	Auriga

So on to an exceptional asteroid. From the page, I will choose... **20461 Dioretsa**, the most highly inclined minor planet... practically retrograde, and discovered in the 20th century. We should be able to see that one... No? Well, it's the first discovered retrograde asteroid, discovered by the LINEAR project. Can you guess where its name came from? Try to guess for 30 seconds, and then peek here:

https://en.wikipedia.org/wiki/20461\_Dioretsa

It's actually in the sky right now, but probably close to 20th magnitude... Plugging in its number... it's actually not far from 18 Melpomene and Mira.

#### Deep sky targets in Orion

Best known of all constellations after the big dipper, and more fun to find, if a little less useful for navigation, Orion has some really bright stars, the brightest nebula, and stars that will soon go supernova (comparatively speaking). Orion's 3 belt stars are each

#### Asteroid 20461 Dioretsa

(Continued on <u>page 6</u>)



more than 20,000 times as bright as our sun, and will burn out in a few million years. Interestingly, the one in the middle of the belt, Alnilam, is much farther away, and including its UV output, it's been estimated to be more than half a million times as bright as the sun. It's the 29th brightest star in our sky, slightly variable, and will reach its highest transit altitude from our point of view, on December 15th at midnight.

Although neatly arranged for us to see the constellation, Orion's stars are actually scattered quite far apart in space, ranging from 427 to more than 1400 light years distant. Recent math done by the Hipparcos survey has refined the distance of Alnilam to 600 parsecs, so far that it boggles the mind of astrophysicists who wonder how it might be that far away and still so bright.

Orion is also home to the **Orion Nebula**, with its small group of newly formed stars, which we call the Trapezium. Those 4 massive stars are within a light year of each other. A good telescope and seeing displays several more. Within 10 light years of the trapezium there are more than 2000 stars.

#### Variable Star, Mira

You won't have a break from me talking about **Mira**, so you might as well go out and find it. I noticed that in the light curve contributors, there are several from Canada, who list their organization as RASC. Well. Wouldn't an HAA look good in that chart?

You can make light curves like the screenshot below by just visiting the link below in your browser, and naming the star. When you get to that link, it will show you a random star. Select Mira by pressing the 'Plot Another Curve' button.



Mira is yours to discover. Only by seeing it while it is still dim, will you appreciate it fully when it brightens. You can also observe its rich red colour. Note the gaps in Mira's recent light curve. Sometimes it's too close to the sun to observe when near its maximum, but this year it's very well timed, and you can follow it all the way to its peak and part way beyond.

#### Astrophysics Special Interest Group

I found a recent, high precision light curve for Mira, and you can see that it rises from magnitude 8 to 3 faster than 1 magnitude per week. Imagine the astrophysics involved for a star to become so much brighter so quickly.

Speaking of Astrophysics, one of its mainstays is variable stars, and the mechanisms that power them. This month, before our Dec 9 General meeting, from 6:30 to 7 PM, we will have a short presentation from our Astrophysics Special Interest Group, at the Spectator Auditorium. Mike Jefferson will present what's interesting about the Cosmic Microwave Background.

#### The Eclipse of August 2017

The "Great American Eclipse" will be happening in August 2017. There are a limited number of camping spots left at the place where the HAA members have made reservations. Contact me (e-mail address is at bottom of this page) for more information. I estimate camping fees and food will total about \$90/person, plus gas. 12 members are currently booked for the trip.

# Astrophysics Discussion Group Meeting Summary by Mike Jefferson

The Astrophysics discussion group met for the first time last month in the party room of Jim Wamsley's apartment building. Those present were Doug Black, Doug Currie, Steve Germann, Mike Jefferson, Cole Marsh, Patricia Marsh, Bruce Pawlett and Gary Sutton. Snacks (cookies) were supplied by Doug Black and Steve Germann, for which we thank them.

We spent the first 15 minutes organizing our meeting times, format and content. Since this was the first meeting of a brand new interest group within the HAA, the preliminaries took a little longer than future meetings will have. There will be one meeting/month and it will be either the 2nd Sunday after the HAA monthly general meeting OR will be held at the Spectator Auditorium on the Friday from ~6:15 - 7:25, before the start of the monthly HAA general meeting.

Doug Black did the kick-off presentation with his PowerPoint theme "Ladders to the Stars". In short, this programme summarized most of the ways and methodologies that astronomers and physicists use to measure distances to stars, planets, galaxies and all other objects in the universe. It was well organized, enjoyed by all and provoked much discussion over some of the concepts presented. 80 slides were covered in ~1.5 hours.

The December Astrophysics meeting will be presented by me, and will be about the CMB - the Cosmic Microwave Background in the universe, from the COBE to the Planck. Some related topics will be touched upon also.

The astrophysics group welcomes the participation of any HAA membership or general public to quietly join the meeting in progress on December 09/16, before the start of the general meeting. At this point the group has sustainers to make and present subject matter, and a chairman to do the reporting, so it's all set.

If you would like to be included on future emails and participate in the group, let the Observing Director, Steve Germann, know by email... observing 'at' amateurastronomy.org

Wanted --- Dead and Alive Part III by Bruce Pawlett

#### Schrödinger's Cat - Wanted: Dead and Alive The Double Slit Experiment and the Multiverse (Part III of III)

#### Recap

As a quick reminder, in Part I of this article the various sophistication levels of the double slit experiment were discussed including the Delayed Choice Quantum Eraser experiment. It was shown that in between creation and detection, particles do not exist as particles but as probability waves. The probability waves exhibit usual wavelike behaviour such as creating interference patterns until something happens to collapse it (e.g. observation). The Copenhagen interpretation tells us that when this occurs the probability wavefunction collapses into a single reality and there is a definite transition from wave to particle. This applies to a particle or system of particles. While this interpretation seems to explain the experimental results and human perception, it lacks scientific rigour. Also, it can be considered to be at odds with the core theory of quantum mechanics.

Part II covered the Big Bang, Inflation, Eternal Inflation, the Level I multiverse and the Level II multiverse. The Level I multiverse consists of similar universes beyond our observable Universe that have the same physical laws & constants, but with minor differences due to random variations. The Level II multiverse is the inevitable consequence of eternal inflation where universes are created wherever inflation stops. Level II universes are separated by inflating areas and are speculated to have similar physical laws but varying constants.

#### **Quantum Field Theory**

The Level III multiverse is where it really gets fun, but to fully comprehend the significance of the wave-particle debate, it is best to touch upon Quantum Field Theory (QFT) that is core to the standard model. In his book, "The Big Picture: On the Origins of Life, Meaning and The Universe Itself" Caltech Cosmologist Sean Carroll describes a field as kind of the opposite of a particle. Fields stretch across throughout space taking on some value at every point. Quantum Field Theory is based on the viewpoint that "particles and the forces that make up atoms all arise out of fields".

There are two types of fields, the 'bosons' or force carrying fields and 'fermions' that make up matter. Bosons can pile on top of one another to create force fields, for example photons creating electromagnetic force or gravitons to create gravity. Fermions on the other hand cannot exist in the same place at the same time. Fermions are the quarks that make up protons and neutrons as well as leptons (electrons, neutrinos etc.). (Refer to Standard Model Flowchart by Sean Carroll at the top of page 10).



Every force and particle has a corresponding field. In empty space, the fields (except the Higgs field) hover around a zero value. Particles are just small vibrations in quantum fields, for instance an electron is a vibration in the electron field, an up quark is a vibration in the up quark field etc. The mass of the particle is just the *(Continued on page 10)* 



energy required to get its field to vibrate. Everything is made up of fields. Reality consists of vibrational waves in quantum fields. Numbers in quantum fields can represent you and me. Our cell phones work because the transmitted information travels as waves through quantum fields. Observation (not necessarily conscious) causes the waves to resolve into what is perceived as particles. This "perception of particles" is just that, as pointed out by Sean Carroll, they do not really exist. We refer to them as such because of our human need to express concepts in terms how we experience or interface with reality, not necessarily what is reality. It is a convenient representation.



These fields interact and influence one another even to the extent of transferring energy from one to another. This is how "new particles" are detected at the hadron colliders and how radioactive decay works. A heavy vibration may not be stable and thus will transfer its energy to other quantum fields. A "particle" does not turn into other "particles" nor is it made up of component particles. A vibrating field transfers its energy to other fields. Refer to this diagram of a W Boson decaying into an electron and anti-neutrino (from Particles, Fields (Continued on page 11)

# Wanted --- Dead and Alive Part III (continued)

and the Future of Physics - Sean Carroll lecture at Fermilab 2013).

A couple of side notes. One, the Higgs field is the only non-zero energy level field in empty space. It is because of this and its interaction with the other fields that elementary particles gain mass. Second, the information that is known in the initial fractions of a second around the Big Bang is derived from the particle accelerator experiments.

#### Level III Multiverse

So now we know that our Universe essentially consists of vibrations in quantum fields that can be described by Schrödinger's wavefunction equation. (There is a wavefunction for our entire Universe!) The Standard Model accurately describes the world we live in. All the particles that affect us have been detected except for the graviton. "There is no new particle, no new field, no new force that we will ever discover that will have an impact on our literal, everyday biology or environment" -Sean Carroll. We could discover others but they would both be either too short-lived or too weak to have any consequence for us.

Thus, our world, as how it directly applies to us is well understood. The Schrodinger equation is the heart of quantum field theory that is the core to the Standard Model and our understanding of how our world works. But, fundamentally it is not compatible with the Copenhagen Interpretation. There is no known mechanism that would convert a wave to an actual "particle" and render the wavefunction non-existent. There is nothing in the math that requires the collapse of the wavefunction. The Copenhagen Interpretation can be considered to be just words used to explain away a phenomenon that is not understood. There is not any evidence that the interpretation is correct.



In 1957 Princeton grad student Hugh Everett III proposed an alternative idea in his Ph.D. thesis (The Theory of the Universal Wavefuntion). "The wavefunction never collapses. Ever." Everett realized that "even if experiments didn't have definite outcomes, it would still seem as though they did". In his Mathematical Universe book Max Tegmark used the Quantum Cards thought experiment to illustrate. Imagine you had a quantum card perfectly balanced and you bet \$100 it would fall face up. You close your eyes and the quantum card falls down both face up and face down in superposition (as described by its wavefunction). You open your eyes and your wavefunction describes you as being both happy and sad at once. Our Universe has split into two; one of you is happy with an extra \$100 in one universe and one of you is minus \$100 and sad in the other universe. The happy you will never be aware of the sad you and vice versa.



Now back to Schrödinger's cat, according to Evertt's interpretation the cat is dead and alive. It is dead in one universe with unhappy cat lovers but very much alive in another. But where are all these universes? They exist in what "mathematicians call Hilbert space, an abstract space with infinitely many dimensions where the wavefunction lives." The concept of Hilbert space emerged from German mathematician David Hilbert's (1862-1943) effort to "generalize the concept of Euclidean space to an infinite dimensional space." Euclidean space (the everyday space we are all familiar with) is



one instance of a Hilbert space. Hilbert space has proven useful for using alge-(Continued on page 12)

# Wanted --- Dead and Alive Part III (continued)

braic methods for solving difficult problems in calculus. Hilbert space has become integrated into quantum mechanics and is commonly used to explain phenomena such as quantum entanglement.

Unfortunately for Everett, the science community was not so keen on his concept. Not only was it ignored for a decade but also, it had significant negative repercussions on his career. Finally, famous quantum-gravity theorist Bryce DeWitt threw his weight behind it and called it the "Many Worlds interpretation". Tegmark mentions that DeWitt initially challenged Everett that "he didn't feel like he was splitting into parallel versions of himself". Everett responded, "Do you feel like you're orbiting the Sun at thirty kilometers per second?" DeWitt conceded defeat and became an advocate.

Tegmark points out that while we observe superposition at the quantum level, we have never observed evidence of large objects being in two places at once, even if not looked at. His explanation is that superposition is dependent on isolation. At the quantum level wavelike characteristics are displayed until observation results in decoherence (wavefunction collapse). All it takes is one photon to cause decoherence. Large objects cannot obtain such isolation so will not display wavelike characteristics.

In 1803 Thomas Young could not have known that his double slit experiment would lead to over two centuries of controversy and the possibility of our Universe splitting into many. The Copenhagen interpretation appeals to our sensibilities and seems to correspond to our reality but has no basis. The rigorously deterministic Many Worlds interpretation (MWI) mathematically aligns with Schrödinger's wavefunction and makes sense from a quantum field theory - wave mechanics perspective but is counter intuitive to our sensibilities. Its acceptance "implies that all possible histories and futures are real", every possible outcome of every event occurs in non-communicating worlds. It is noted that there are many interpretations of what the MWI means. Some are more careful to relate the emergent worlds specifically to "determinate decoherent substructures of the quantum state". This is a more limited viewpoint since emergent worlds are not every possible outcome of every event but only occur when a related substructure quantum decoherence occurs.

But this is still significant as the clear interpretation of the Many Worlds Interpretation advocate David Deutsch (Oxford University): "An atom and its electrons are multiversal objects and that multiversal object is what quantum mechanics is describing. Now, that means that the parallel universe aspect of reality as described by quantum theory must apply to objects of all sizes: humans, stars, galaxies - everything!"

#### Level IV Multiverse

The Mathematical Universe Hypothesis (MUH) is Tegmark's own contribution to the various multiverse theories. MUH: Our external reality is a mathematical structure. Tegmark insists that MUH is implied if we accept the External Reality Hypothesis (ERH). ERH: There exists an external physical reality completely independent of humans. Current successful theories are "limited aspects of external reality" and the holy grail of physics "The Theory of Everything" (TOE) remains elusive.

If we accept ERH, according to Tegmark the description of the Universe, of reality must be "devoid of human baggage". There should not be references to terms such as "particle" or "observation" but should be defined in terms that non-human sentient entities could understand (e.g. supercomputer). Mathematical structures are "baggage-free" and transcend universes. Universes do not have to exist; yet mathematical truths will remain true. There could be many mathematical structures from which universes emerge and we find ourselves in one with the necessary physical laws and constants to support life.

(Continued on <u>page 13</u>)

#### Simulated Universe

The 2003 Nick Bostrom paper "Are You Living in a Computer Simulation" argues that one of the following is true:

- The human species is very likely to go extinct before reaching a post-human stage;
- Any post-human civilization is extremely unlikely to run a significant number of simulations of their evolution history (or variations thereof);
- We are almost certainly living in a computer simulation.

It then follows that the belief that there is a significant chance that we will one day become post-humans who run ancestor-simulations is false, unless we are currently living in a simulation.



Bostrom suggests that in the future, computing power will be capable of people simulations that are conscious. Since these computers will be so super-powerful they will be capable of running many such simulations. This increases the probability that our minds are simulated minds rather than original. Although Bostrom himself is on record for saying # 3 is less than 50% likely in an interview, Elon Musk (CEO SpaceX and Tesla) indicated it is almost certainly true that we live in a simulated universe. The Simulated Universe concept has its proponents.

Mathematically, a simulated universe is possible and is compatible with the Mathematical Universe Hypothesis. However, as Tegmark points out the concept leads to an infinite regress of creators and still does not address the existence of the original universe.

# Discussion

There is much to contemplate. Admittedly, sometimes I wonder if my curiosity is a curse. It seems that every time I explore a topic it is like peeling a 4 dimensional onion. Just when you think you understand something there is another and yet another layer. Even beyond that, most often the complexity of each layer is dependent on the effort put in to understand and the limit of one's ability to comprehend.

Perhaps, these concepts seem far-fetched and certainly some are. The Mathematical Universe Hypothesis is heavily criticized and I believe that very few buy into the simulated universe. Max Tegmark is known as "Mad Max" because of his unorthodox viewpoints but is well respected. That is how science successfully progresses, many if not most of the significant scientific breakthroughs have been achieved through radical approaches. Tegmark was clear that "parallel universes are not a theory - they are predictions of certain theories". If there is a high level of credence in the underlying theory then those predictions are more likely.

The Copenhagen and the Many World Interpretations attempts to resolve the double slit experiment/measurement problem dilemma are only two of several. The Copenhagen Interpretation matches perception but is not mathematically sound. The Many Worlds Interpretation is a more pure interpretation of the mathematics of quantum mechanics and thus the least complex, but its conse-

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# Wanted --- Dead and Alive Part III (continued)

quence is unfathomable to many. All are considered interpretations and not theories because as of yet they do not provide any falsifiable predictions.

Nobel laureate Steven Weinberg describes the two approaches as "instrumentalist" and "realist". Instrumentalists believe the wavefunction is just a tool for mathematical calculations while realists believe the wavefunction is real, it evolves over time and is responsible for reality. Weinberg finds the shut-up-and-calculate instrumentalist approach "unattractive" and believes that a deeper theory perhaps beyond quantum mechanics is needed.

Understanding the conundrum of the double slit experiment is key to our understanding of reality. An open mind is essential to pursuit of the knowledge of reality and it is very, very likely that reality is not exactly what it appears to be!



# The Twelve Days of Christmas by Bernie Venasse

The Twelve Days of Christmas is most likely the observance of the relationship of two astronomical cycles and events.

The Feast of the Epiphany is a Christian observance, and the reason there are "Twelve Days" of Christmas is because there are 12 days between the birth of Jesus on December 25 and the Feast of the Epiphany on January 6. The Feast of the Epiphany is "A Christian feast celebrating the manifestation of the divine nature of Jesus to the Gentiles as represented by the Magi."

There is a very interesting relationship between two astronomical events, one in December and one in January, that further research revealed occurs on the average of twelve days apart every year: twelve is the number of days between the December Winter Solstice and the date in January that the sun is at Perihelion (closest to the planet Earth).

Could it possibly be a coincidence that the number of days between Winter Solstice, when the Sun's strength is reborn, and Perihelion, when we in our orbit are closest to the sun, is the same as the number of days between Christmas, the day we celebrate the birth of a male deity, and Epiphany, the day the people were enlightened as to his holiness? Keep in mind: There is no such thing as coincidence.

The Sun has almost always been a symbol of masculine energy, strength, and divinity; most cultures did at one time worship a male deity represented by the sun. The god most often associated with the Winter Solstice is Mithra or Mithras, the masculine sun god of the Persians (and later worshiped by the Romans) who was born on the day of the Winter Solstice, the day the sun regains his strength.

Another spiritual symbol associated with the sun is the halo (often associated with Jesus) which is representative of the inner light or divinity that shines forth from holy people. Light itself is very often symbolic of intelligence, as when we say a person is "bright" which is a way to say he is "smart," or spiritual achievement as when one is "enlightened."

A couple of thousand years ago, the Winter Solstice was on the twenty-fifth of December, so Perihelion would have occurred around January 6. Due to calendar reform over the millennia, the Winter Solstice now falls as early as December 20, and as late as December 23, and Perihelion usually occurs between January 2 and 4, occasionally as late as January 5.

Astronomical events don't always follow an exact schedule, so the number of days between the Winter Solstice and Perihelion can be as few as 11 and as many as 14. However, on the average, the Winter Solstice and Perihelion are separated by twelve days - those Twelve Days of Christmas.

# NASA's Space Place



# This article is provided by NASA Space Place.

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.

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# Dimming stars, erupting plasma, and beautiful nebulae

By Marcus Woo

Boasting intricate patterns and translucent colors, planetary nebulae are among the most beautiful sights in the universe. How they got their shapes is complicated, but astronomers think they've solved part of the mystery—with giant blobs of plasma shooting through space at half a million miles per hour.

Planetary nebulae are shells of gas and dust blown off from a dying, giant star. Most nebulae aren't spherical, but can have multiple lobes extending from opposite sides possibly generated by powerful jets erupting from the star.

Using the Hubble Space Telescope, astronomers discovered blobs of plasma that could form some of these lobes. "We're quite excited about this," says Raghvendra Sahai, an astronomer at NASA's Jet Propulsion Laboratory. "Nobody has really been able to come up with a good argument for why we have multipolar nebulae."

Sahai and his team discovered blobs launching from a red giant star 1,200 light years away, called V Hydrae. The plasma is 17,000 degrees Fahrenheit and spans 40 astronomical units—roughly the distance between the sun and Pluto. The blobs don't erupt continuously, but once every 8.5 years.

The launching pad of these blobs, the researchers propose, is a smaller, unseen star orbiting V Hydrae. The highly elliptical orbit brings the companion star through the outer layers of the red giant at closest approach. The companion's gravity pulls plasma from the red giant. The *(Continued on page 16)* 

# NASA's Space Place (continued)

material settles into a disk as it spirals into the companion star, whose magnetic field channels the plasma out from its poles, hurling it into space. This happens once per orbit—every 8.5 years—at closest approach.

When the red giant exhausts its fuel, it will shrink and get very hot, producing ultraviolet radiation that will excite the shell of gas blown off from it in the past. This shell, with cavities carved in it by the cannon-balls that continue to be launched every 8.5 years, will thus become visible as a beautiful bipolar or multipolar planetary nebula.

The astronomers also discovered that the companion's disk appears to wobble, flinging the cannonballs in one direction during one orbit, and a slightly different one in the next. As a result, every other orbit, the flying blobs block starlight from the red giant, which explains why V Hydrae dims every 17 years. For decades, amateur astronomers have been monitoring this variability, making V Hydrae one of the most well-studied stars.

Because the star fires plasma in the same few directions repeatedly, the blobs would create multiple lobes in the nebula—and a pretty sight for future astronomers.

If you'd like to teach kids about how our sun compares to other stars, please visit the NASA Space Place: <u>http://spaceplace.nasa.gov/sun-compare/en/</u>.



This four-panel graphic illustrates how the binarystar system V Hydrae is launching balls of plasma into space.

Image credit: NASA/ESA/STScI



# Super Moon Gallery November 13 – 14, 2016



...from near Brantford, Ontario, by Janice Mannering.



...from Burlington, Ontario, by Bob Christmas.

# Super Moon Gallery (continued)





Above: Super Moon over Hamilton, Ontario, by Ann Tekatch.

*Left*: High-up Super Moon, by John Gauvreau

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# **UPCOMING EVENTS**

**December 9, 2016** - 7:30 pm – *HAA Meeting* at the Hamilton Spectator Auditorium. Our main speaker will be Gord Williams, and his talk will be about building an observatory in Muskoka.

January 13, 2017 - 7:30 pm – HAA Meeting at the Hamilton Spectator Auditorium.

# 2016-2017 Council

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