



Events:

General Meeting :

Monday, Nov 5, 2018 at the Ronald H. Roberts Temecula Library, Room A, 30600 Pauba Rd, at 6:30 PM. It is a joint meeting with "Space Out" a group of high school science students. Skip Southwick will do a What's Up and the presentation is by Gene Perry of JPL titled "Ocean Worlds". At 8:00PM the Club will retire to Room B for the TVA business meeting and Board of Directors elections.

Please consider helping out at one of the many Star Parties coming up over the next few months. For the latest schedule, check the Calendar on the [web page](#).



Dark Molecular Cloud Barnard 68 - Credit: FORS Team, 8.2-meter VLT Antu, ESO

General information:

Subscription to the TVA is included in the annual \$25 membership (regular members) donation (\$9 student; \$35 family).

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WHAT'S INSIDE THIS MONTH:

Cosmic Comments

by President Mark Baker

Looking Up Redux

compiled by Clark Williams

Random Thoughts

by Chuck Dyson

November's Dance of the Planets

by Jane Houston Jones and David Prosper

Send newsletter submissions to Mark DiVecchio <markd@silogic.com> by the 20th of the month for the next month's issue.

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Cosmic Comments by President Mark Baker

Speaking of Outreach...following is my submission from two years ago about providing a current Mission update for the newsletter. We had a few step up and then I got off track and let the idea slide...but it's time to renew the fervor!!! It is still information that is worth a quick share, if not even more than back then, so you are all forewarned that I'll be pushing it again...

Cosmic Comments – Nov 2016

While racking my brain to find ways to allow for more participation by TVA members, I must admit I was pretty ecstatic to come up with having a member – or several – contribute a current space related Mission status, domestic or foreign, to our monthly newsletter. I couldn't wait to announce the opportunity at our meeting and be overwhelmed by those wanting to be involved...and the next meeting...and the next meeting!! But not one soul volunteered... It's not often I succumb to disappointment and say, "Oh well...I tried", and I won't in this case!!! There is sooooo much happening off planet by so many entities and co-op's that I am even more convinced that this is information that is good to know and should be shared. That being my stance, I will try for a volunteer one more time, and then I'll make some personal contacts until I find a party, or parties, that can find the interest and the time to take this on. If nothing else, I'll have to threaten the Club with me doing it, and I'm sure you all hear enough from me already...!!!

Regardless, I so enjoy being a part of this organization and the good it truly does in our communities. I am proud to know you all.

Clear, Dark Skies my Friends...





Looking Up Redux compiled by Clark Williams

from sources:

[Sky and Telescope](#)

[Wikipedia](#)

[in-the-sky.org](#)

[The American Meteor Society, Ltd.](#)

[NASA.gov](#)

[TVA App](#)

[FullAndNewMoon App](#)



ALL TIMES ARE LOCAL PST WILDOMAR/MURRIETA/TEMECULA

Times are given in 24-hour time either as hh:mm:ss or hhmmss. A time given as hhmm+ indicates that it is the hour of the next day. Similarly a time hhmm- indicates a time in a previous day. Some times are hhmm and seconds are not shown.

Don't forget to "fall back" your clocks by one hour on the 4th of November. PDT is -7hrs from UT; PST is -8hrs from UT.

Moon Phases for the month by date: (all times are PST)

Wednesday the 7th @ 0813 NEW in Libra
Thursday the 15th @ 0655 FIRST QTR in Capricornus
Thursday the 22nd @ 2140 FULL in Tarus
Wednesday the 29th @ 1620 THIRD QTR in Leo

Apogee comes on 2018-11-14 @ 0758 – 404, 340 km (251, 246 mi)

Perigee comes on 2018-11-26 @ 0411 – 366, 622 km (227, 809 mi)

2018 has: (12) new moons, (12) 1st Qtr moons, (14) Full moons, (13) 3rd Qtr moons
(2) Blue moons and (1) Black moon

Luna: Luna will rise late on the first peeking above the horizon about forty minutes past midnight giving you plenty of dark skies for viewing. Luna is heading toward New on the 7th of the month so you should have some dark nights until the 15th when Luna has gotten around to rising about noon-forty local time. And won't be setting until twenty-before midnight. By the end of the month we're deep into the 3rd quarter and dark night viewing will be back. In fact on the 30th Luna has hit the pillow by 1300 and you will have a full dark night for viewing.

Luna V and X: In the early part of this century there was some excitement over the finding of the letter "X" and the letter "V" sitting happily on the lunar surface. Both of these are **clair-obscure** affects. In each case the rim of craters cast shadow that appear to form the letters on the surface of Luna. The letters form over some time (the X can form over one-to-three hours). Since they are **clair-obscure** affects you need the terminator to creep across the craters to form the light and shadow components making up the letters. In the case of the "X" and "V" the first quarter (½ of the moon face lit up) is the best time. Check the following two month table values:



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Date	Time	Local	Sun Angle at the X at this time
11/15/18	0859UT	0059PS T	-0.903 @ X
12/14/18	2246UT	1456PS T	-0.935 @ X

We can see from the above table that December is out since the phase happens at almost 1500 our time. But if you are willing to stay up until about 0100 on November 15th you have a pretty good chance of catching the Lunar “X” and the Lunar “V” (see image below).

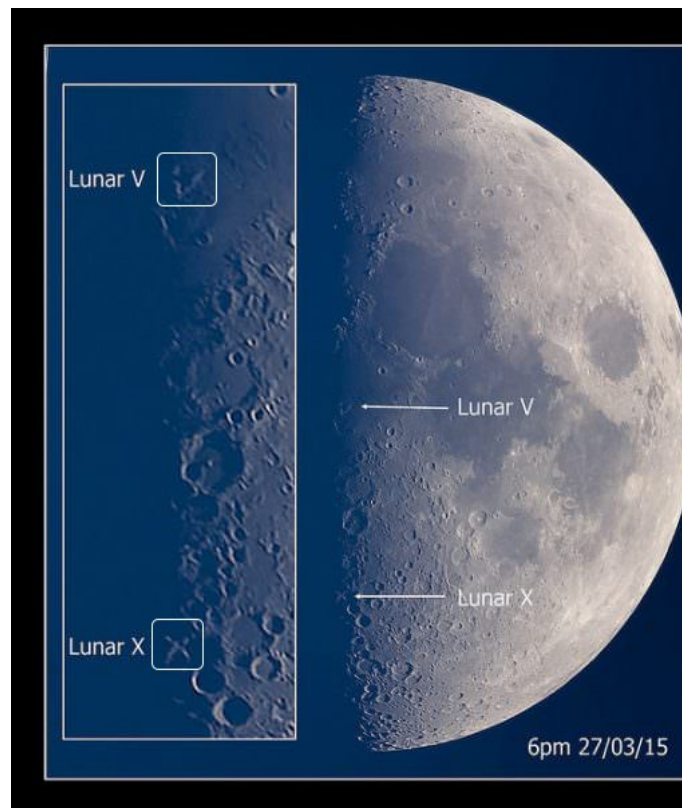


Illustration 1: The Lunar X and the Lunar V features

Image credit and copyright: Mary Spicer

The X should be visible for about 3 hours (weather permitting). The Lunar X (aka the Werner-X or Purbach Cross) is formed by the rims of the Werner (shown below), Blanchinus, La Caille and Purbach craters.

Werner Crater info:

Coordinates: 28.0°S 3.3°E

Diameter: 70 km

Depth: 4.2 km

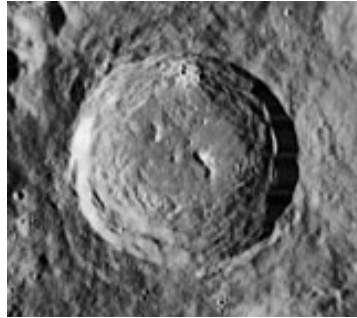


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Colongitude: 357° at sunrise

Eponym: Johannes Werner



Highlights: (distilled from Sky & Telescope and Clark's planetary Orrey program[s])

5 November: Evening – Some astronomers love occultations and if you look east-northeast just after sunset on the 5th you'll see Aldebaran slip behind the moon from the limb that is lit reappearing from behind the limb that is dark. This is better the more east and north you are.

17-18 November: All Night – Leonids. Moon is Waxing Gibbous just past First Quarter. These are remnants of 55P/Temple-Tuttle

29-30 November: Evening – Algol again at minimum around 2204.

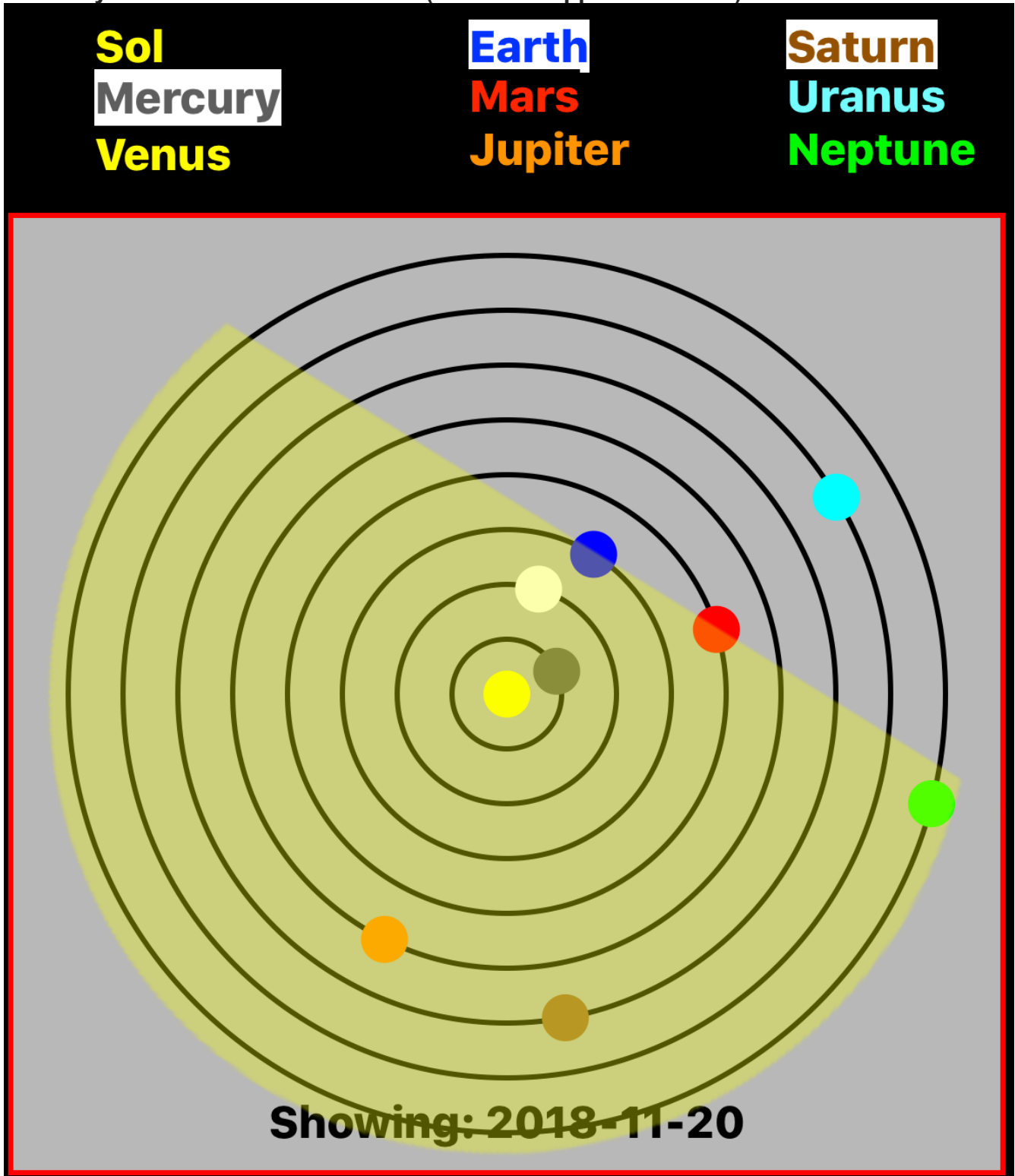


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Planets:

Planetary Positions November 2018: (from TVA App iOS version)





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- **Mercury:** The Winged Messenger is lost to the glare of the Sun all month.
- **Venus:** She's slipped from being the Evening "Star" into being the Morning Star. Your best bet is in the beginning of the month.
- **Mars:** Mars is still dazzling this month transiting on the first about 1943 and not setting until 0100+. Mid month finds Mars has moved into Aquarius. Transiting about 1819 and setting around 2347. The warrior is much nearer the western horizon. But keep an eye on Neptune. From our perspective it appears that Mars and Neptune are closing the gap between them. By the end of November they appear only 4°6' apart. Mars is in Aquarius and visible until 2333. The planet feast is almost over until May 2019.
- **Jupiter:** Jupiter is fading in the west where you can get a glimpse at dusk until around the 7th of the month.
- **Saturn:** The start of November you'll have from dusk until 2123 By mid month Saturn has begun setting at dusk and we'll just have to wait for May 2019.
- **Uranus:** Uranus is rising at 1724 in the beginning of the month and doesn't set until 0631+. It is a good time to try imaging this jewel or even to try and find it. Uranus is worth it though and since it is at magnitude +5.7 and 100% illuminated it is not an impossible target even in an 8-inch scope. By mid-month you'll find Uranus rising about sunset and again not setting until early next morning. The end of the month finds Uranus visible from sunset until 0332+.
- **Neptune:** Neptune is still trailing Mars visible in the beginning of the month by an hour after sunset and transiting at 2105. Giving about 3 hours of viewing and/or imaging time. By mid-month Neptune has closed to within about 13°33'38" of Mars and the Moon. By the end of the month visible within 4°6'3" (follow the Ecliptic toward the east and you will find Neptune). You can observe or image Neptune until 2353.
- **Pluto:** Pluto is dim this month and like the Elves of Númenor fading in the West. By the end of the month Pluto will be setting before sunset.

Asteroids:

- Thursday 15 November: Asteroid 2015-TB145 can be spotted toward the west along the ecliptic 8°4'45" from the waxing Gibbous moon you'll need very dark skies and a very large aperture to find this one.
- Friday 16 November: Asteroid 3 Juno it will be visible between 19:59 and 04:06. It will become accessible at around 19:59, when it rises 21° above your eastern horizon, and then reach its highest point in the sky at 00:04, 52° above your southern horizon. It will become inaccessible at around 04:06 when it sinks to 22° above your western horizon.

Meteors:

- In 2018, the Leonids will peak on the night between Nov 17–18.

Comets:

- Comets come in various classifications:
 - 1) Short Period comets – further broken down into:
 - Halley Type: The Halley Types are believed to come from the Kuiper Belt and have periods in excess of 20-years.
 - Jupiter Type: The Jupiter types have a period less than or equal to 20-years.



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- Short period comets may have a near circular orbit or an elliptical orbit. The latter being far more common.
- 2) Long Period comets – thought to originate from the Oort cloud these comets have periods of over 200 years and have random inclinations around the celestial sphere.
- **46P/Wirtanen** –Originally discovered in 1889 by the American astronomer Lewis Swift, 64P rounds the Sun every 9.2 years. This time around it hangs out in the vicinity of Beta (β) Andromedae from late October through late November when it's brightest at magnitude 11. Not only is it well placed in the evening sky, the bright star will serve as a sweet guidepost. Is at perihelion on Monday 10 November and reaches its brightest on Sunday 19 November.
- **Comet 38P/Stephan-Oterma** – Long time no see! The 38th comet to have its orbit determined also takes 38 years to orbit the Sun. Discovered in 1867 and last seen in 1980, those of us who missed it then (yeah, yours truly) will finally get a second chance. It's predicted to be a fine apparition with the comet entering the stage 5° north of Betelgeuse in Orion at magnitude 10.5 during the first week of October. Come late November, it peaks around magnitude 9 in Gemini near Castor and Pollux and may be visible in binoculars. 38P remains brighter than magnitude 10.5 through New Year's Day 2019.: <http://www.cometwatch.co.uk>)

Deep Sky:

In each case you should look for the following on or about the 15th Day of November 2018 at 2100 PST and you will have about 20 minutes of viewing time total.

The one thing November brings us is deep sky beauties, calmer winds and the potential for gorgeous viewing and imaging:

- **Alberio** – Beta Cygni is about 415 light-years (127 pc) away from the Sun. When viewed with the naked eye, Alberio appears to be a single star. However, in a telescope it resolves into a double star consisting of β Cygni A (amber, apparent magnitude 3.1), and β Cygni B (blue-green, apparent magnitude 5.1). Separated by 35 seconds of arc, the two components provide one of the best contrasting double stars in the sky due to their different colors.(Wikipedia) I just love this star you can find it easily at the end of the Northern Cross. It will fade quickly in the west. But it is still visible around 2100 through mid-month. This gorgeous double star is just stunning in even a small scope.
- **The Iris Nebula** – AKA NGC 7023 and Caldwell 4 is a bright reflection nebula and Caldwell object in the constellation Cepheus. NGC 7023 is actually the cluster within the nebula, LBN 487, and the nebula is lit by a magnitude +7 star, SAO 19158. It shines at magnitude +6.8. It is located near the Mira-type variable star T Cephei, and near the bright magnitude +3.23 variable star Beta Cephei (Alphirk). It lies 1,300 light-years away and is six light-years across. (Wikipedia)
- **IC 342** – AKA Caldwell 5 : is an intermediate spiral galaxy in the constellation Camelopardalis relatively close to the Milky Way. Despite its size and actual brightness, its location in dusty areas near the galactic equator makes it difficult to observe, leading to the nickname "The Hidden Galaxy", though it can readily be detected even with binoculars. The dust makes it difficult to determine its precise distance; modern estimates range from about 7 Mly to about 11 Mly. The galaxy was discovered by William Frederick Denning in 1892. It is one of the brightest in the IC 342/Maffei Group, one of the closest galaxy groups to the Local Group. Edwin Hubble first thought it to be in the Local Group, but it was later determined not to be a member. In 1935, Harlow Shapley found that it was wider than the



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full moon, and by angular size the third-largest spiral galaxy then known, smaller only than the Andromeda Galaxy (M31) and the Triangulum Galaxy (M33). (Modern estimates are more conservative, giving the apparent size as one-half to two-thirds the diameter of the full moon). It has an H II nucleus. (Wikipedia)

- **Gamma Andromedae** – AKA Almach; actually a quadruple star system. In 1778, Johann Tobias Mayer discovered that γ Andromedae was a double star. When examined in a small telescope, it appears to be a bright, golden-yellow star (γ 1 Andromedae or γ Andromedae A, also named Almach) next to a dimmer, indigo-blue star (γ 2 Andromedae or γ Andromedae B), separated by approximately 10 arcseconds. It is often considered by stargazers to be a beautiful double star with a striking contrast of color. It was later discovered that γ 2 Andromedae is itself a triple star system. What appears as a single star to the naked eye is thus a quadruple star system (Wikipedia) Go out and find this! It is a treat any small to mid-sized scope can resolve and is almost as beautiful as Alberio. To find this beauty follow the right arm of the “Big W” using those two stars as pointer stars to the first brightest star you can find. That will be Almach. While you're in the area you might as well check out the Andromeda Galaxy.

November is great for both planetary and deep sky viewing and imaging. Spend some time outside with your scope. Summer is here Autumn is coming.

For now – Keep looking up.





Random Thoughts by Chuck Dyson

ARE THEY OUT TO GET US!?

NO, NO, NO I am not paranoid and it is not exactly a bad thing that it always seems that today everyone including other scientists are always questing and doubting scientific claims. But, as my good friend Barry Bloom was want to say on more than one occasion, “just because you are paranoid does not mean that they are not out to get you”.

If one is only working to find the truth how can they be bad and how can looking for the truth be a bad thing?

As always the battle starts with the Greeks and it starts with Plato who is more or less pissed that his teacher and mentor Socrates, who Plato sees as only committing the “crime” of searching for and teaching the truth, has been condemned to death by the citizens of Athens because they did not understand or recognize, in Plato’s opinion, when something was true. Plato sets out to remedy this deplorable situation and writes an essay titled “The Sophist” in this essay, two groups argue over what it means to know something. The two antagonists are the Earth Giants and the [Sky gods](#) (convention demands that I use a small letter for gods instead if a capitol letter).

In the essay the Earth Giants argue that you can know something if you garner enough information about that something so you can say beyond a reasonable doubt that you can predict an outcome of that something or predict some future action by that something; then the Earth Giants argue that by being able to predict actions and affects you have knowledge and know about that thing.

Hold on just a minute, say the Sky gods, because they have an entirely different definition of what it means to know something. In the Sky gods universe one can only claim to know something if it was universal, timeless, necessary, and certain. The definition of knowing something by the Sky gods leaves exactly no wiggle room for further developments or discoveries because to know something means nothing new or different can be discovered about the thing you claim to know. In order to limit the argument of what it is to know something, the English monk Adelard of Bath in the 12th century posts that science is a closed system [epistemologically](#) (natural phenomena can be explained by natural causes only, no magic) and science is a closed system [ontologically](#) (after creation nothing fundamental can be added to the universe or destroyed, no action by gods or God). Finally mathematics is to be the language of describing scientific results (in my friend’s lab at UCLA, he had a saying by Dr. [Alfred Blalock](#) put up on one of the walls “If you cannot speak in numbers, your knowledge is of the meager kind”) because math seems to be universal, necessary, and certain (the formula for the area of a circle works no matter where you are or how big or how small your circle).

Now all of the admittedly esoteric stuff may have remained interesting debating subjects for a small group of university professor types except in 1450, Johannes Gutenberg starts producing



books from a printing press, the famous Gutenberg bible was not his first book but his most famous, and suddenly anything and everything can be printed and distributed in mass.

Gutenberg is followed in 1517 in Wittenberg, Germany by Martin Luther and his 95 thesis document that he nailed to the front door of the Wittenberg church. Priests putting up documents challenging church dogma was one way the disgruntled got discussions going on changes that they thought the Church should make; but in this case, and this may have been the first time a document was leaked to the press, the document was printed up on the newfangled printing press and distributed to one and all.

As humans we are [wont](#) to become defensive when criticized in public and as the members of the different Church factions polarized and became entrenched in their respective positions, the result of this was the start of the Reformation and the rise of the Protestant movement. The Catholic Church feeling much threatened by all of this implemented ecclesiastical courts (Inquisition) to insure adherence to Church dogma through admonition and persuasion, not through punishment.

Into this maelstrom of religious intrigue comes [Giordano Bruno](#). Bruno is first noted to be a brilliant but nonconformist student at the monastery he is in. Bruno is then admitted as a formal student of theology at university where at the end of three years of study he was informed not that he had graduated but that he was under investigation by the Inquisition for his ideas on the solar system, time to leave. For the next twenty years Bruno is an itinerant teacher and tutor around Europe and is very popular with the various people and students he comes into contact with and during this time Bruno also publishes 34 books on techniques for improving memory, there are no computers to store your data on, and his vision of the universe which includes solar systems like ours around every star and other star cities, galaxies, like the star city that we live in.

In his books on the design of the solar system Bruno takes direct aim at the Church backed Ptolemaic solar system. Bruno moves back to Italy to work for a rich patron, big mistake, and is arrested by the Inquisition and over the next six years they build the case against him, for his part Bruno is totally unrepentant or willing to compromise. The head of the Inquisition a [Cardinal Robert Bellarmine](#) finally signs his death warrant and he is burned at the stake in the field of flowers just outside of the Vatican. Cardinal Bellarmine sends several other heretics to the stake and then in 1616 a Galileo Galilei is brought before Bellarmine and instead of having him sent to the stake he writes a letter to Galileo telling what he must not do concerning the Copernican theory and what he can do.

Why the letter instead of physical punishment is unclear, perhaps there was building pressure to stop the burnings. However, in 1633 Galileo is brought back to face another Inquisition for writing a book titled *Dialog Concerning the Two Chief World Systems* and in this book he trashes both the Pope and the Ptolemaic system and this time no letter of reprimand although it is probably Bellarmine's letter and Galileo's ability to argue that he was writing theoretically that saved his skin and got him house arrest for the rest of his life.



So as we look at these two cases was the Church out to get the individuals or out to get science? In the case of Bruno we have social chaos; there are new branches of the Protestant movement popping up every few months, and Bruno saying one of the things that the Church has that works, the Ptolemaic calendar, is worthless and wrong and that Copernicus is correct and the Church's view of a universe that is Earth centered with everything else stuck on crystal spheres, is stupid wrong while he, Bruno, has the true vision. Neither side has any real empirical data to put forward just theoretical arguments with the exception that functional calendar; so, with no basis for either argument the party in power wins, good-bye Giordano.

In the case of Galileo starting with the title of his book, *Dialog Concerning the Two Chief World Systems*, is not an honest statement because there were not two but three valid world systems at that time and the third the Tycho Brahe system was as at least as valid an explanation for the orbits of the planets as the Copernican system. Also by this time it was becoming clear that the Copernican system was, at best, only just as good as the Ptolemaic system at predicting planetary positions and calendar dates. Given the fact that Galileo presented only $\frac{1}{2}$ of the solar system argument in his book and his claims about the validity of the Copernican system were only validated after the work of Kepler, Newton, and Cassini, who first calculation of the accurate distances between the planets and sun, was done and the Church had a system, Ptolemaic that worked for their purposes. With the information that the Inquisition had, at that time, the decision to place the old coot under house arrest seems to be reasonable and humane, considering his state of health and all.

Is there any way we can obtain knowledge that meets the Sky gods criteria? Wait! What about math? It is absolutely universal, necessary, and certain. No sooner are the words out of our mouths than a young Joseph Fourier publishes a paper on equations that describe how heat works in solid objects but says nothing about the nature of heat. Just a fluke paper you say as Fourier is followed closely by James Clerk Maxwell with his equations that describe the interactions between electric and magnetic fields that produce an electromagnetic field that travels at the speed of light with no description of what is the nature of an electric field or a magnetic field. Math, it seems, can let us manipulate and understand how to work with our universe but does not necessarily have to tell us how the universe works.

The major problem with us knowing things to be true as the Sky gods define truth is our method of doing science is called "Affirming the Antecedent" and this leads to problems. Let me demonstrate; If my theory is correct when I mix an "I" and a "B" together by a specific process I will get two "P"s, I mix the two letters together and I get two "P"s; therefore, my theory is correct. Sorry, not so! There could be many other reasons besides my specific process that I get two "P"s. This problem was put forward in spectacular fashion by [Heinrich Hertz](#) when in the 1890's he publishes his "*Principles of Mechanics*" and in his forty page introduction takes on the problem of "Affirming the Antecedent" showing that he can explain all Newton's equations using invisible masses and not the masses of the objects themselves. This is quite controversial and seems to violate brother [Adelard of Bath](#)'s admonition to invoke no magic to explain the universe.

In 1990 astronomers are basically doing two things; the first is excitedly announcing to one and all that they have measured about 95% of all the matter in the universe and, after measuring



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the rate of expansion of the universe using type Ia supernova are about to determine if the universe is open, closed, or static, the second is they busily lift the carpet in their offices and sweep under it some odd and non-conforming observations by [Fritz Zwicky](#) and [Vera Rubin](#) suggesting that there should more mass in galaxy clusters and rotating galaxies than we can see.

In the year 2000 the supernova teams are announcing that the universe is expanding but not slowing down but rather accelerating. Astronomers who are modeling the formation of the universe on computers are announcing they can only get galaxies and galaxy clusters to form if they embed them in pools of matter that cannot be seen and are of a size that is equal to Zwicky's and Rubin's calculate missing mass. Enter dark energy and dark matter and take a bow professor Hertz because you got it right.

Although Plato framed the question he never answered it and never proved that Socrates was trying to get his students to find the pathway that leads to the real and absolute truth. Note: the truth that he was trying to get the students to see was the democracy was insane and the government should only be run by a small group of the elite. The trial and sentencing of Socrates may have had just a touch more justice to it than you have been lead to believe. In the end it would be a good thing for us to recognize and accept that our approach to science and our scientific methods will always leave room for doubt as to what the truth is and this should remind us to:

Always keep an open mind.

Cheers,
Chuck





November's Dance of the Planets

By Jane Houston Jones and David Prosper

November's crisp autumn skies bring great views of our planetary neighbors. The Moon pairs up with Saturn and Mars in the evenings, and mornings feature eye-catching arrangements with dazzling Venus. Stargazers wanting a challenge can observe a notable opposition by asteroid 3 Juno on the 17th and watch for a few bright Leonid meteors.

Red **Mars** gleams high in the southern sky after sunset. **Saturn** sits westward in the constellation Sagittarius. A young crescent Moon passes near Saturn on the 10th and 11th. On the 15th a first quarter Moon skims by Mars, coming within 1 degree of the planet. The red planet receives a new visitor on November 26th, when NASA's InSight mission lands and begins its investigation of the planet's interior. News briefings and commentary will be streamed live at: bit.ly/landsafe

Two bright planets hang low over the western horizon after sunset as November begins: **Jupiter** and **Mercury**. They may be hard to see, but binoculars and an unobstructed western horizon will help determined observers spot them right after sunset. Both disappear into the Sun's glare by mid-month.

Early risers are treated to brilliant **Venus** sparkling in the eastern sky before dawn, easily outshining everything except the Sun and Moon. On November 6th, find a location with clear view of the eastern horizon to spot Venus next to a thin crescent Moon, making a triangle with the bright star Spica. The following mornings watch Venus move up towards Spica, coming within two degrees of the star by the second full week of November. Venus will be up three hours before sunrise by month's end – a huge change in just weeks! Telescopic observers are treated to a large, 61" wide, yet razor-thin crescent at November's beginning, shrinking to 41" across by the end of the month as its crescent waxes.

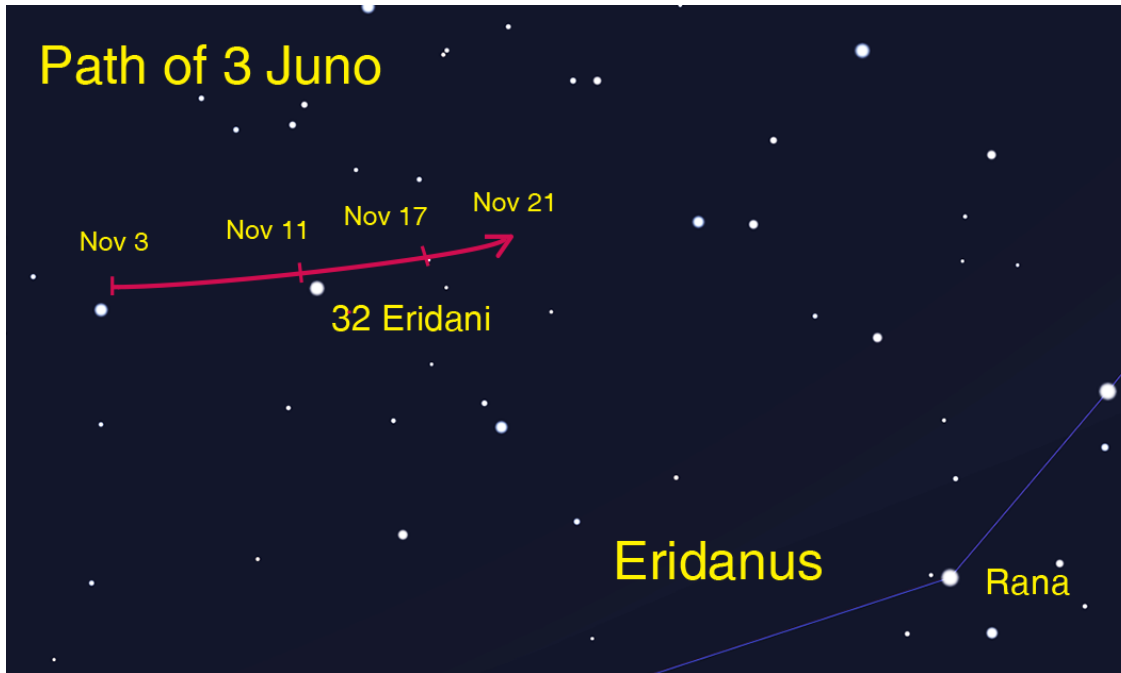
Observers looking for a challenge can hunt asteroid **3 Juno**, so named because it was the third asteroid discovered. Juno travels through the constellation Eridanus and rises in the east after sunset. On November 17th, Juno is at opposition and shines at magnitude 7.4, its brightest showing since 1983! Look for Juno near the 4.7 magnitude double star 32 Eridani in the nights leading up to opposition. It is bright enough to spot through binoculars, but still appears as a star-like point of light. If you aren't sure if you have identified Juno, try sketching or photographing its star field, then return to the same area over the next several days to spot its movement.

The **Leonids** are expected to peak on the night of the 17th through the morning of the 18th. This meteor shower has brought "meteor storms" as recently as 2002, but a storm is not expected this year. All but the brightest meteors will be drowned out by a waxing gibbous Moon. Stay warm and enjoy this month's dance of the planets!

You can catch up on all of NASA's current and future missions at nasa.gov



With articles, activities and games **NASA Space Place** encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!



This finder chart shows the path of the asteroid 3 Juno as it glides past 32 Eridani in November 2018. The asteroid's position is highlighted for selected dates, including its opposition on the 17th. Image created in Stellarium for NASA Night Sky Network.

This article is distributed by NASA Night Sky Network
The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit <https://nightsky.jpl.nasa.org> to find local clubs, events, and more!





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The TVA is a member club of [The Astronomical League](#).

