Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers   Dec 2016

Events:

General Meeting : NO MEETING IN DECEMBER.

Next General Meeting : Monday, Jan 9, 2017 at the Temecula Library, Room B, 30600 Pauba Rd, at 7 pm.

For the latest on Star Parties, check the web page.

NASA APOD 17 Dec 2014 - Geminid Fireball over Mount Balang - Image Credit: Alvin Wu

WHAT'S INSIDE THIS MONTH:

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

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Cosmic Comments – Dec/2016
by President Mark Baker

Last year, I took some time to wander through the JPL and NASA websites and I thoroughly enjoyed the journey. Both have exceptional and quality videography related to their specific and joint missions. This year, as a Solar System Ambassador for NASA / JPL, I was able to use so much of that same information, photos and videos - that are exclusively provided to us - for presentations all over the world… literally!!! I thoroughly enjoy sitting in on the online conferences, and following along with the presentations, usually PowerPoint… I have learned so much detail about missions - past, present, and future – that I feel almost guilty about not sharing more with all of you. That is what drives my request for somebody, anybody, to provide Mission updates every month for our newsletter… and if no one else will volunteer, then I guess I'll spread the wealth around and delegate it out every month. So you've all been forewarned…but I hope you'll take on "the call" in the spirit in which it is intended, and not only learn a lot yourselves, but share that edification.

Here's to all you do, in every way you do it…keep looking up because you may never know who sees you and looks up themselves!!!

Clear, Dark Skies my Friends…

Canopus Calling

by Will Kramer

Low along the southern horizon
Where it can only shine for us,
A luminous, long enduring sun
Is known as Canopus.

Yet confidently it beckons there
For all to “notice me”,
As it was brightest in our sky
Till rather recently.

“Yes, for so long I was your number one,
As early humans could attest,
A million years ago or more
They knew I was the best!”

So, for a few more hundred thousand years
It waits patiently for the day,
When short-timers, like Sirius,
Move along their merry way…..

Looking Up – Dec 2016
by Curtis Croulet

Winter Solstice is December 21 at 2:44 AM PST. At that time, the Sun is as far south as it can go, and that will be the longest night of the year.

First Quarter Moon is December 7 at 1:03 AM PST; **Full Moon** is December 13 at 4:05 PM PST; **Last Quarter Moon** is December 20 at 5:56 PM PST; **New Moon** is December 28 at 10:53 PM PST.

Mercury is available for viewing during the first couple of weeks of December. It reaches greatest eastern elongation on December 11. By, say, Christmas, Mercury will be too close to the Sun to observe. Inferior conjunction is December 28.

Venus is in the southwestern sky as darkness falls. It brightens from mag -4.2 to -4.4. Greatest eastern elongation is January 12, 2017. Venus reaches inferior conjunction (between the Sun and the Earth) on March 25, 2017.

Mars moves from Capricornus into Aquarius, climbing higher on the ecliptic. Mars remains visible in the evening sky all month. It's too small to view detail, even if you have a very big telescope. Mars fades from mag +0.6 to +0.9.

Jupiter is now in the morning sky in Virgo. It rises as early as 1 PM by month's end.

Saturn is in southern Ophiuchus. The ringed planet is creeping toward conjunction with the Sun on December 10. By December 31 Saturn will be visible low in the pre-dawn sky.

Uranus is in Pisces, available for viewing most of the night.

Neptune has seen better days, er, nights. It's close to the meridian at nightfall. It sets as early as 9:30 PM by December 31. The October issue of *Sky & Telescope*, p.50, has excellent finder charts for both Uranus and Neptune.

I think we can wrap up **Pluto** for the year. It's too close to the Sun for viewing now.

One of our best meteor showers is the **Geminids**, which peak on the night of December 13-14. Alas, we also have full Moon that night, which will drown out all but the brightest meteors. The other meteor shower of note is the **Ursa Minorids**, which peaks on the morning of December 22. This time, conditions are good, since the Moon is a waning crescent. The radiant is near the "bowl" of the Little Dipper. The Ursa Minorids are usually sparse, but there have been rare outbursts.

Let's look up.

When last we left the matter of "magnitudes," we were on the subject of "absolute magnitudes." To state the obvious, stars vary in brightness. But are the different brightnesses due to the stars being at different distances from the observer, or because they are intrinsically of different brightnesses?

The answer: both.

In your daily experience, a parking lot light that is blindingly brilliant close up will appear much dimmer when seen from a distance. A dim light seen nearby may appear to be much brighter than the distant parking lot light, even though, were the two lights placed side by side, the searchlight would be seen to be the brighter. In the same way, if you could line up stars at a standard distance of, say, 10 parsecs, then you could see which stars are really brighter and which are fainter. If we do this, then we find that one of the brightest of all stars is Deneb, absolute magnitude -8.73, even though Deneb is only the twentieth brightest star in our night sky. Brilliant Sirius would be seventeenth brightest at a modest absolute magnitude 1.45, and the Sun would be only absolute magnitude 4.83. Remember: low numbers are bright; high numbers are dim.

But what's a parsec? We'll explain that in a moment.

If you observe a nearby star through a high-power telescope from different points of the Earth's orbit, i.e. as the Earth revolves around the Sun, then the star should be seen to move back and forth against the background of more distant stars. This displacement is called *stellar parallax*. After the invention of the telescope, astronomers attempted for two hundred years to detect stellar parallax. It wasn't until 1838 that Friedrich Bessel was able to successfully measure the stellar parallax of the star 61 Cygni. The stellar parallax Bessel measured was 0.314 arc seconds, calculating to a distance of 10.3 light years. This is close to the modern value of 11.4 light years distance for 61 Cygni. Stellar parallax is measurable for stars out to a distance of about 100 light years.

If a star were observed to have a stellar parallax of 1 arc second from opposite sides of the Earth's orbit, then its distance would be 3.2616 light years. Such a star would have a distance of 1 "PARallax SECond" or 1 *parsec*. So, a parsec is 3.2616 light years. No star other than the Sun is that close. The closest star other than the Sun is Proxima Centauri, which has a stellar parallax of 0.7687 arc seconds, corresponding to a distance of 4.243 light years.

Let's return to absolute magnitude. If we were to line up the stars, side by side, at a distance of 10 parsecs or 32.616 light years. then we could see how bright they really are compared to each other. But we need to know their real distances to be able to line them up. The discovery and measurement of stellar parallax for nearby stars was the first step in that process.

In future essays, we'll be talking more about what we can do with this knowledge.

Clear skies.

Stellar Outreach Award

Each person who applies for the Astronomical League's Outreach Award at the Stellar level has to submit a report on one of the Star Parties hosted. As our members apply for this award, the Temecula Valley Astronomer will be publishing those reports. Stellar Outreach Award

Neptune the Beautiful (or, The Value of New)
by Sharon Flemings

After having participated in a number of star parties since I became active in my Club, and fulfilling the number of hours in order to achieve this award, I realized it's often tempting to show the same thing to star party participants at each event. Of course this makes volunteering for these events much easier, but it can also lead to ambivalence in introducing even the most popular stellar objects to participants who have never had the opportunity to look through a telescope before. Don't we want to get something out of our investment of time and energy, too?

Recently, I had the opportunity to volunteer with the Explore the Stars program on Palomar Mountain, for a weekend of star parties. One of my friends suggested we find something new to look at - "How about Neptune?", he asks. "Wow" I think to myself - I've never even tried seeing Neptune before. How could I resist? So, in short order, we located the general location of Neptune, debating its possible location nearby two candidate stars. I selected the star which I thought was correct, and sure enough - there it was! A small, bluish gray object right where I expected to see it. What a treat for the eyes! I probably spent 15-20 minutes observing.

It was still early enough in the evening that I was able to share it with several star party attendees. I was also able to locate it the following night, too, for the star party and share it with a number of people. It was an exciting evening for both participants and myself, being able to view Mars, Saturn and Neptune, not to mention the excitement of adding another object to my list of observations. Going forward, I intend as often as possible to find new objects in the heavens to observe at star parties, and not limit myself to those I've found and shared before. After all, isn't finding new objects what astronomy is all about?

Listening to the Solar System and the Stars

by Clark Williams

All astronomy is electromagnetic observations, whether visual or non-visual astronomy it does not matter.

Non-visual astronomy has traditionally fallen into the realm of the (over) zealously guarded camp of the “Professional” astronomer. There are many reasons for this, primarily because the antennae (dishes) and electronics necessary to do the observations are expensive.

Technology has this wonderful trend line that almost always causes the line to point lower on the right hand side of the line rather than on the left hand side. When cost is factored over several years this trend has made the tools that were too costly in the infancy of the science to be affordable now. Not always inexpensive, mind you, but attainable.

We’ll take a look at two possibilities for an amateur astronomer interested in doing real science in the non-visual range of the electromagnetic spectrum.

In 1998, I got involved with a **NASA** educational program to introduce students (of all ages) and the science-interested-public to a discipline of what we will call “RADIO” astronomy. A better name is perhaps “selected spectral” astronomy.

Most of us are somewhat familiar with this kind of astronomy; big dish astronomy. We think of this kind of astronomy as indoor, daytime astronomy. Which on some winter nights when the temperature is near freezing can be an enticement for looking into this observational alternative.

From the **Radio JOVE** web site: “The Radio JOVE project is a hands-on inquiry-based educational project that allows students, teachers and the general public to learn about radio astronomy by building their own radio telescope from an inexpensive kit and/or using remote radio telescopes through the internet. Participants also collaborate with each other through interactions and sharing of data on the network.”

Radio JOVE is a self sustaining **NASA** program that allows you to get hands on experience in making and interpreting radio spectra and phenomena directly from your own radio telescope. The kit is designed to look specifically at Sol and Jupiter but is being used to collect galactic information as well.

Over 1100 of the **Radio JOVE** radio kits have been purchased and built. The kit consists of a receiver for 20MHz coupled to either one or two dipole antennae. You need only one if you are listening to Sol since it is so annoyingly loud, like doing visual astronomy around the moon. You need two dipoles to focus on Jupiter. Equipment manuals for the **Radio JOVE** Kits are available free online: http://radiojove.gsfc.nasa.gov/telescope/equipment_manuals.htm

The History

Bell Labs in the 1930s was investigating short wave radio transmissions to be used in transatlantic radio telephone service. They assigned Karl Jansky (b. 1905 OCT 22, Norman OK; d. 1950 FEB 14) to the project to look for interference sources. He noticed three sources of interference:

1) nearby thunderstorms
2) distant thunderstorms
3) a faint steady hiss of unknown origin.

This third source needed some investigation and Jansky found that it had a period of approximately 24 hours. Jansky first thought that he was seeing radio interference from the Sun but soon the source moved away from the Sun and he was able to pin down the rate to approximately: 23 hours and 56 minutes — sidereal time. He discovered that the radio source was strongest near the center of our galaxy. Bell Labs didn't want to pursue this phenomenon but others picked it up and Radio Astronomy was born.

What is going on?

Jovian radio storms were first noticed soon after scientists picked up where Jansky left off around 1955. Although it took a little time to figure out what was really going on.

Jovian radio storms are a result of Io and the natural Jovian radio lasers. Jupiter’s magnetosphere forms a region called the *Io Torus*. As Io orbits Jupiter it smashes into the *Io Torus* and makes waves. These waves. known as “Alfvén waves” carry about 40 trillion watts of power to Jupiter’s polar regions. This is sufficient wattage to power the Jovian radio storms.

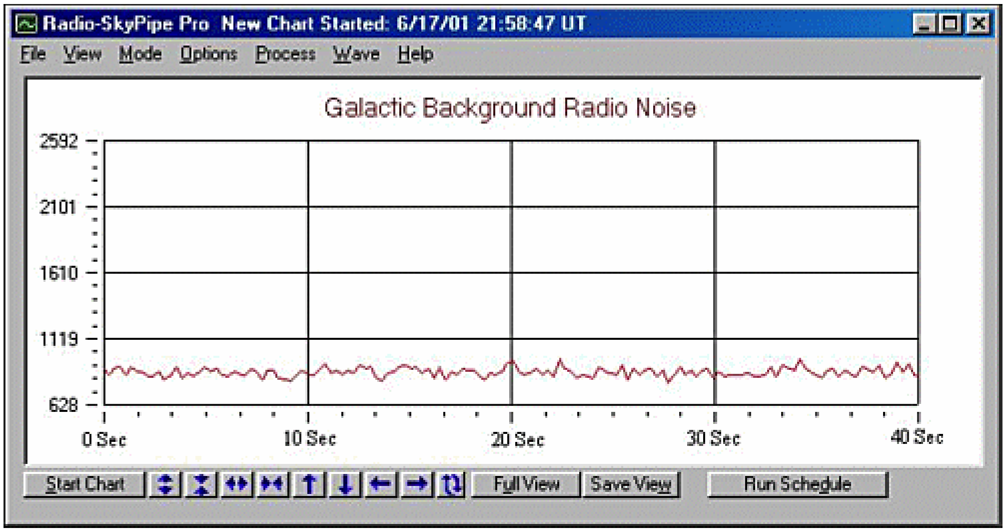
There are many classifications of the Jovian radio storm spectra. Some are clicks and whistles (S-bursts) while some sound more like waves at a beach (L-bursts). No two Jovian storms sound alike.

To complicate things, Jupiter's Io-controlled radio emissions are not omnidirectional. The radio laser beam has the shape of a wide hollow cone. If Earth is in the cone we hear nothing. If Earth is outside of the cone we hear nothing. If we’re in the transition edge of the cone we can hear some strong radio bursts.

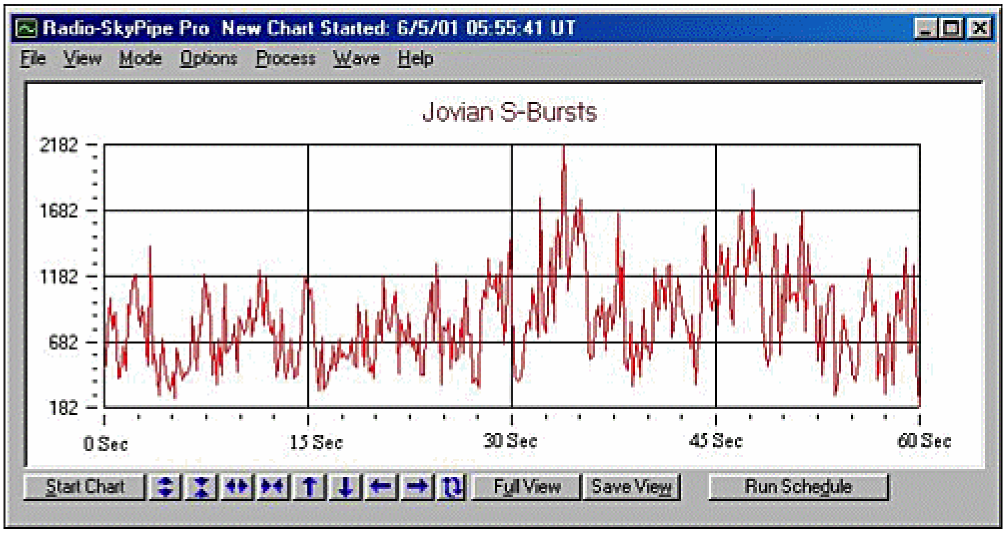
What will you hear?

As mentioned above we can hear S-bursts and L-bursts from Jupiter, Solar bursts are completely different in sound and finally there is the Galactic background noise. Since we’re in the 20MHz range we also can hear voices, radio stations and other interference.

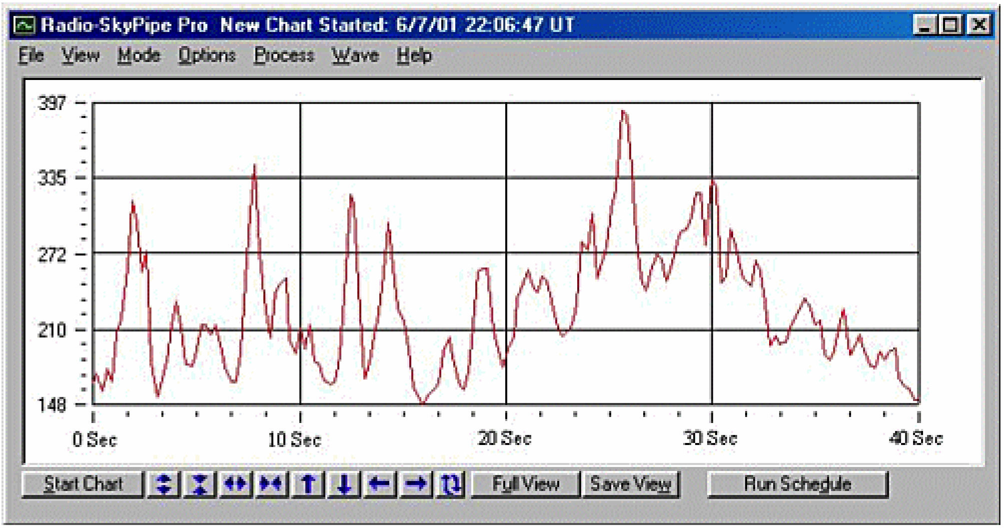
Galactic background noise is generated from virtual particles spiraling around in the galactic magnetic field. Overall the sound is soft and quiet. Here is an example from the **Radio JOVE** archives: http://radiojove.gsfc.nasa.gov/observing/samples/galactic1.wav



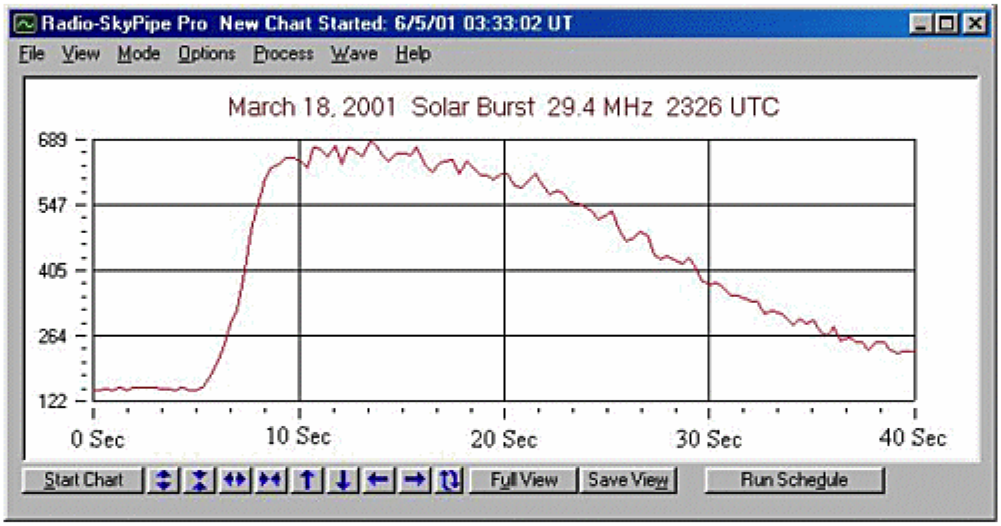
S-bursts sound like woodpeckers or whales (**Radio JOVE** archives):
http://radiojove.gsfc.nasa.gov/observing/samples/sbursts1.wav



L-bursts sound like waves on a beach (**Radio JOVE** archives)**:**
http://radiojove.gsfc.nasa.gov/observing/samples/lbursts1.wav



Solar Bursts near 20MHz often turn on rapidly and decay more slowly (**Radio JOVE** archives):
http://radiojove.gsfc.nasa.gov/observing/samples/solar1.wav



New Players In The Telescope Market

There are several manufacturers entering into the radio telescope market. One of the first of these is PrimAluce Labs and may be found at http://www.primalucelab.com/radioastronomy

PrimAluce Labs produces several products in the 2 meter to 3-meter diameter range.
Their contact information is: Via Roveredo 20/b, 33170, Pordenone, Italy, +39 0434 1696106

What Can TVA Members Do?

I have a full Radio Jove kit. If the Club is interested in getting into Radio Astronomy I'll be happy to donate the kit to the Club and we can set it up out by the observing site.

The receiver is already built but not aligned. The radio receiver and antennae kit costs about $200 (US) but the parts are easily obtained from Radio Shack, Mouser, DigiKey, Marlin P. Jones, etc and we can make as many of these as we wish to. The circuit board is two layer (top and bottom) and easily built. The antennae dipoles need some PVC for poles and some human labor to situate and tie them off.

We as a Club could join **Radio JOVE** as an observer site (costs the Club nothing) and begin uploading and downloading information to the **Radio JOVE** archives and analyzing data. This could be an educational outreach to the local schools as well.

You could also build one of these and put it up in your backyard. Probably not a condo/apartment because the antennae is too large but the antennae is easily erected in a small yard.

If anyone would like to participate please contact me either through the Club email list or at clarkw_at_s-i-g-h_dot_com and I'll put together a list of those interested.

Keep looking up (and listen while you do).

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.

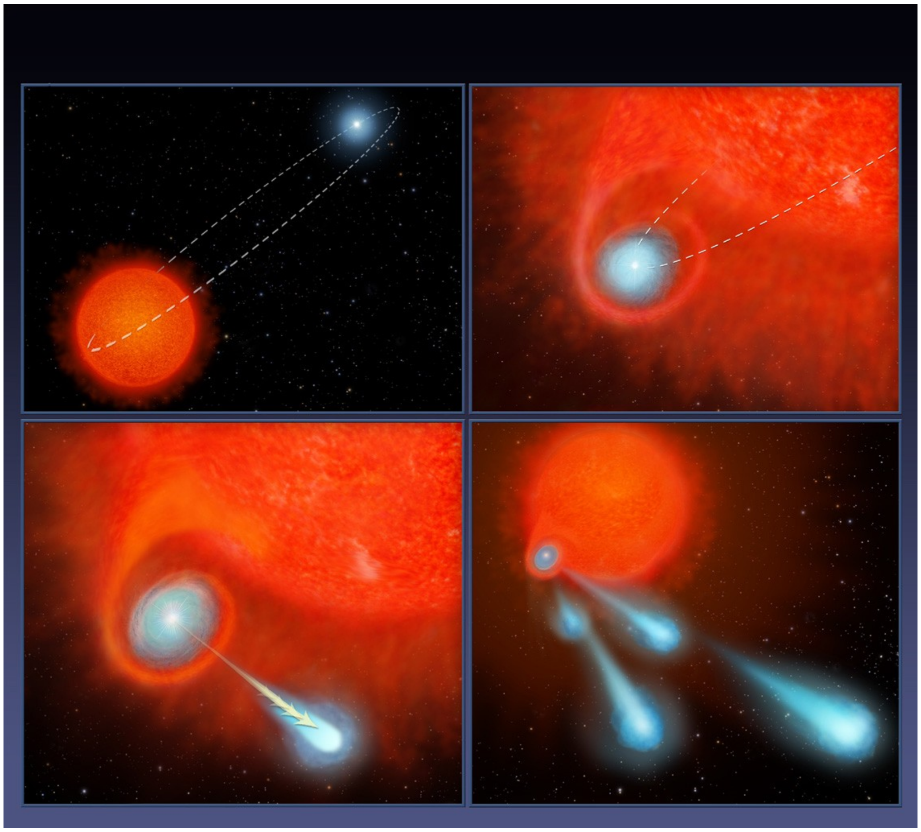
The launching pad of these blobs, the researchers propose, is a smaller, unseen star orbiting V Hydrae. The highly elliptical orbit brings the companion star through the outer layers of the red giant at closest approach. The companion's gravity pulls plasma from the red giant. The material settles into 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: http://spaceplace.nasa.gov/sun-compare/en/



This four-panel graphic illustrates how the binary-star system V Hydrae is launching balls of plasma into space. Image credit: NASA/ESA/STScI

This Article is provided by NASA Space Place.
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The TVA is a member club of The Astronomical League.