Current Astronomy

RIVER BEND ASTRONOMY CLUB NEWSLETTER

NOVEMBER/DECEMBER 2010

This image was obtained on 2010 October 8.08 UT (the evening of October 7), as the comet was approaching the Double Cluster in Perseus. I used an Orion EON 80-mm ED Apo refractor (f/6.25) and a Canon T2i digital camera. The camera was set at 1600 ISO and single 2-minute exposure was obtained. The field of view is 1.3°.

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River Bend Astronomy club serves astronomy enthusiasts of the American Bottom region, the Mississippi River bluffs and beyond, fostering observation, education, and a spirit of camaraderie.

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Check out our **online calendar** on the NASA Night Sky Network, a nationwide coalition of amateur astronomy clubs bringing the science, technology and inspiration of NASA's missions to the general public.

Monthly Meetings

Saturday, November 6, 2010 • 7:00 PM
Saturday, December 4, 2010 • 7:00 PM
Saturday, January 8, 2011 • 7:00 PM
For meeting locations, please see our calendar at http://nightsky.jpl.nasa.gov/event-calendar.cfm?Club_ID=285

Looked Up Lately?

Join River Bend Astronomy Club

Want to learn more about astronomy? The members of River Bend Astronomy Club invite you to join. You won't need expensive tools or special skills – just a passion for observing the natural world.

- Meetings offer learning, peeks through great telescopes, and fun under the stars.
- You will receive the club newsletter, *Current Astronomy*, packed with news and photos.
- Get connected with our member-only online discussion group.
- Borrow from the club's multimedia library.
- Borrow from the club's selection of solar telescopes.
- And that's not all! Through club membership you also join the Astronomical League, with its special programs and colorful quarterly newsletter *The Reflector* to enrich your hobby.
- We meet monthly, observe regularly, email news and quips constantly, and generally have a good time. Won't you join us?

Name____
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Where did you hear of our club?__________________
____
How long have you been interested in astronomy?_____
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Are you afraid of the dark? ___Yes ___No (just kidding)
I am submitted my application for:
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I enclose a check for $_______________ made out to:
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Comet 103P/Hartley 2

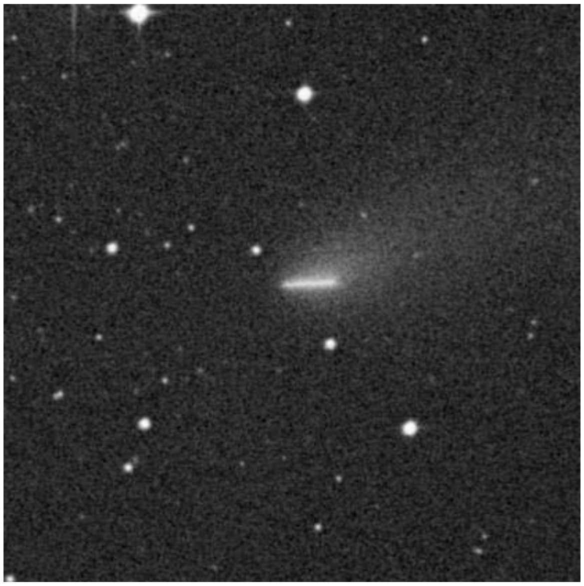
By Gary Kronk

The story of comet Hartley 2 begins with the birth of our solar system, where it formed within the Kuiper Belt. It is not known how many millennia passed before something altered the comet's orbit, sending it into the inner solar system. What we do know is that the comet's present orbit is a result of a series of gravitational dances with the planet Jupiter.

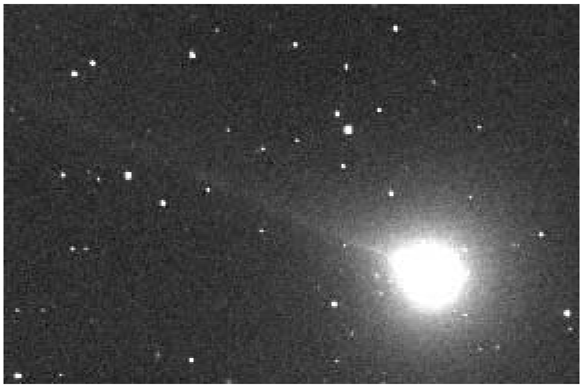
By the beginning of the 20th century, the comet was moving in an orbit with a period of 9.3 years and a perihelion distance just inside the asteroid belt. The comet passed 0.22 AU from Jupiter during August 1947, which reduced the period to 7.9 years and the perihelion distance to 1.62 AU. The comet then made a very close approach of 0.09 AU from Jupiter during April 1971, which reduced the period to 6.1 years and the perihelion distance to 0.90 AU. The comet was now moving in an orbit that allowed it to pass inside the orbit of Earth. Although it could now become bright enough for the telescopes of amateur astronomers to find, the comet's returns in 1973 and 1979 were poorly placed, with the closest approach to the sun coming when Earth was on the other side of the sun.

The comet's orbit was altered by another dance with Jupiter during November 1982. The closest distance between the two bodies was 0.33 AU, which increased the period to 6.3 years and the perihelion distance to 0.95 AU. The comet was now moving in the orbit that led to its discovery, which came on March 15, 1986. Malcolm Hartley (Siding Spring Observatory, New South Wales, Australia) found the diffuse trail of the comet while examining plates exposed using the 122-cm UK Schmidt Telescope. After acquiring further photographic plates on March 17 and 20, Hartley reported the comet to the appropriate authorities. It was immediately recognized as a short-period comet, with a period of 6.3 years. The comet was eventually designated 103P/Hartley 2, indicating it was the 103rd confirmed periodic comet, and the second periodic comet found by Hartley.

Comet Hartley 2 was well observed during its returns in 1991 and 1997, with its maximum brightness reaching magnitude 8 on each occasion. Jupiter also tugged on the orbit again during December 1993, which increased the period to 6.4 years and the perihelion distance to 1.06 AU. During the latter apparition, astronomers first came to realize that the comet would be passing fairly close to Earth during October 2010.

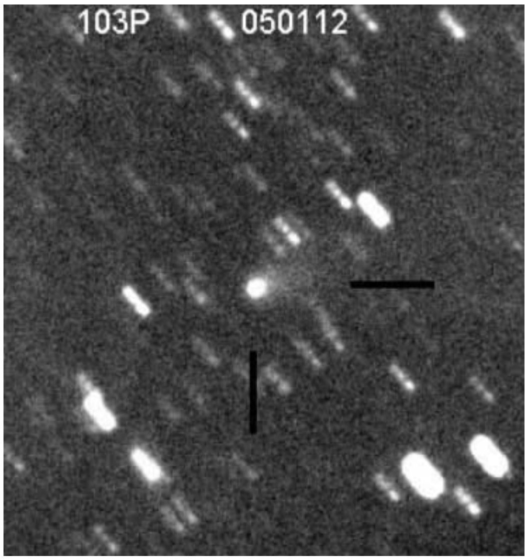


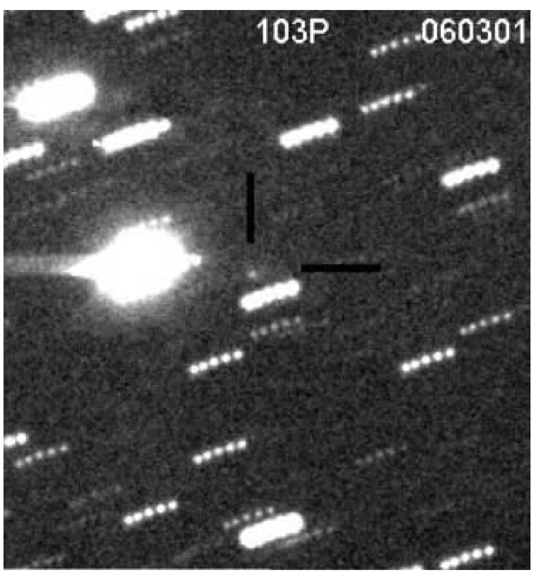
This photograph was obtained by the U. K. Schmidt Telescope Unit, Siding Spring, Australia on 1992 January 15.



This image was obtained on 1997 December 28.73 UT with 36-cm, f/6.7 Schmidt-Cassegrain telescope, V filter and CCD. Exposure time was 5 minutes. Image reversed by Author.

Hartley 2 was poorly observed during its 2004 return, mainly because it was located on the other side of the Sun from Earth when at its brightest. But another chapter in the story of this comet began on January 12, 2005, when NASA launched the Deep Impact spacecraft.





These two images were obtained by Ignacio Ferrin using the 1-m Schmidt telscope (f/3) at the National Observatory of Venezuela. The image at top is a 21-minute exposure and was obtained on January 12.19, 2005. The image at bottom is a 12 minute exposure and was obtained on March 1.20, 2006. Ferrin granted the Author permission to use these images.

Deep Impact's mission was to visit the periodic comet 9P/Tempel 1, release an impactor that would collide with the comet, and analyze the ejected debris. The big event successfully occurred on July 4, 2005. Scientists knew they still had a fully functional spacecraft with high-resolution cameras, so they looked for another comet to study up close. The original idea was to go to periodic comet Boethin, but when astronomers began looking for this comet during 2006 and 2007, it could not be found. The adopted belief was that the comet had broke up and extensive searches when it should have been at its brightest revealed no trace. So, late in 2007, the decision was made to go to Hartley 2.

Comet 103P/Hartley 2 on the evening of September 30, 2010. Copyright © 2010 by Gary Kronk (Kronk Observatory, Illinois, USA)

The first observations of the 2010 apparition were actually obtained during 2008. Requests had been made by NASA to find the comet as early as possible, so that any minor corrections to the orbit could be made and the trajectory of Deep Impact could be adjusted. Astronomers at Paranal Observatory (Chile) obtained 62 images of the comet on May 5 and they acquired additional images on June 1 and 4. The comet was also observed by the Spitzer Space Telescope on August 12 and 13. The Spitzer observations revealed the comet's nucleus was probably around 1.2 km across.

The comet was next observed on 2010 March 12, when the 8.1-m reflector at Gemini South Observatory at Cerro Pachon (Chile) obtained mid-infrared observations. Additional observations were also acquired by the 2.4-m reflector at Magdalena Ridge Observatory (New Mexico, USA) on March 13 and 17.

Professional and amateur astronomers were well aware that the comet would become bright during this apparition and the comet was well-photographed during the late Spring and early Summer months. The first visual observations were obtained early in August. J. J. Gonzalez (Leon, Spain) spotted the comet using his 20-cm reflector on the 6th, while S. Yoshida (Gunma, Japan) saw the comet with his 40-cm reflector on the 7th. The magnitude was then given as 13.2-13.4, while the coma was 0.6' across.

Naked-eye observations were made during October. The first came from Piotr Guzik (Poland) on October 3, while Gonzalez made a similar observation the next night. Both of these observers are very experienced and made their observations from very dark sites. The comet never became a wide-spread naked-eye object, because the coma expanded considerably as it approached Earth. Around the time when the comet was closest to our planet on October 20, the coma was estimated as one-half to at least one degree across. Observers reporting the largest coma were either observing under very dark skies or were obtaining images optimized to detect the greenish glow of carbon molecules within the comet. Only observers under very dark skies were able to see the comet with the naked-eye, even though the maximum magnitude was then around 4.5.

The Arecibo Radio Telescope (Puerto Rico) obtained several observations of the comet during the period of October 24-27. The result was that the comet's nucleus was found to be shaped like a bowling pin. A similar shape was reported for periodic comet 19P/Borrelly, when the spacecraft Deep Space 1 flew passed that comet on September 22, 2001.

Although the comet is now slowly fading, the story of this apparition is not yet over. Deep Impact will fly passed Hartley 2 on November 4. At its closest approach, it will be only 434 miles from the comet and will be seeing features as small as 20-25 feet across. The spacecraft will use two telescopes with digital color cameras and an infrared spectrometer. The latter instrument will determine the chemical composition of outbursts of gas from the comet's nucleus. The gathered data will keep NASA scientists busy for months, if not years.

This image was obtained on 2010 October 6.07 using an Orion EON 80-mm ED Apo refractor (f/6.25) and a Canon T2i digital camera. The camera was set at 1600 ISO and single 2-minute 30 second exposure was obtained. The field of view is 0.8 degree. Copyright © 2010 by Gary Kronk (Kronk Observatory, Illinois, USA)

For those interested in observing meteors, Hartley 2 might have one more surprise in store for us. Back in 1997, amateur astronomer Joe Rao predicted that a meteor shower might occur in 2010, because of the comet's close proximity to Earth. Because the comet would not have been in its current orbit for a very long time, many experts felt a meteor shower was not likely because dust from the comet would not have had enough time to spread very far from the comet. Interestingly, a number of fireballs have been reported during the last half of October. It was announced a few days ago that two fireballs seen on the 16th happen to have had orbits very similar to Hartley 2, so an association is probable. Many of these fireballs have been reported to have emanated from Cygnus, which is where meteors from Hartley 2 would appear to come from. It is predicted that the likely peak in activity from this comet would be on the night of November 2/3. It might be time well spent to keep a watch for meteors this Tuesday night! **RBAC**

Perseid Meteor Shower From Joshua Tree National Park

By Joe Lopinot

It just so happened that my business / pleasure trip to California coincided with the peak days of what the experts were predicting would be the best Perseid meteor shower in several years. Man, I am a lucky guy.

My friend John took off work on Friday, so we packed up our camping gear and headed to Joshua Tree National Park about 5:30 PM on Thursday (August 12th). John lives near Temecula, about half way between LA and San Diego, so it was an easy two hour trip north and east to the northern most of the three entrances to the park, near Twenty Nine Palms. Our site was wonderful, in an area called Jumbo Rocks, about 30 miles into the park (it is a huge national park). The rocks in this area have been heaved and cracked by ancient geologic forces, leaving a lunar like landscape into which this particular campground was nestled. The campground was packed, even though summer is the off season in Joshua Tree, many of them out there specifically to see the meteor show. Temperatures in Joshua Tree can exceed 120° F during the day in August, and drop 50° or more during the night.

Joshua Tree grove. Photo by Joe Lopinot.

If you have never been I highly recommend a trip to Joshua Tree National Park, especially from October through April, when temperatures moderate. The Joshua Tree requires a very specific climate and altitude to grow, and 90% of the world's specimens grow within the boundaries of the national park. If you enter from the southern gate near Palm Springs on I-10, there are no Joshua Trees for many miles as you slowly climb out of the Mojave basin. As you rise in altitude you pass through a series of desert ecosystems until, near Jumbo Rocks where we camped, you enter zones with large groves of mature Joshua Trees. There is a wide variety of plant and animal life in this interesting and beautiful park. The tree was named by Mormons traveling the American West, who thought the contorted limbs of the yucca relative looked like the prophet Joshua pointing the way to the promised land.

Directly behind our campsite was a hill that rose about 100 ft above the campground, strewn with boulders, some as big as a truck. We climbed to the top with the camera, tripod, lenses, two chairs and a cooler full of beer. The site was very dark, with just a hint of sky glow to the northwest (Twenty-Nine Palms) and even less to the southwest (Palm Springs, about 50 miles south). The ribbon of the Milky Way was visible from horizon to horizon and the Andromeda Galaxy easily visible to the naked eye, after about 10 PM. We could hear oohs and aahs from all over the campground as the show heated up.

The first meteors streaked across the pristine desert sky as twilight was still fading. John and I witnessed at least four or five "fireballs" over the course of the night, some of them traversing three quarters of the celestial sphere. Two of them were exceedingly bright, with long, broken tails left in their wake; we could hear reactions from our fellow campers in all directions as these monsters burned themselves out in our atmosphere. At its peak (11 PM to 2 AM) we witnessed probably 30 to 40 meteors per hour, mostly in the north east toward Perseus and Cassiopeia, although stray meteors could be seen in all directions. All told, we probably witnessed between 150 and 200 meteors between 8 PM and 3 AM.

In an attempt to photographically capture some of these streaks, I deployed my Canon Rebel XSi 450D on the Manfrotto tripod, high on the hill above Jumbo Rocks and the desert plain. My new Sigma 20mm f/1.8 lens was the weapon of choice, a real beauty of a lens and my first serious use of it since purchase. I pointed the wide angle in a north easterly direction, at about a 60° angle to the horizon, and attached my Apurture (Canon knockoff / half the price) timer remote to the camera body. The remote is a real life saver for astrophotography, letting me program up to 99 shots at predetermined exposures and intervals between shots. After several test shots I set the system to take a 20 second exposure at f/2.2 and ISO 400 once every thirty seconds. I find that stopping down the lens by one or two stops improves the focus and contrast of the stars in most instances; even at this dark site, sky glow becomes visible at that high an f/stop with any ISO above 400.

I let this rip for about 2 hours, getting about 120 images of this wide swath of the sky. I ended up with 12 of the images with meteors recorded, 10% of the total…not bad for an amateur! The picture below shows one of the better captured images. The meteor was imaged just south of Auriga, with the Pleiades and the Hyades nicely visible to the south and the top of Orion just starting to peak above the horizon. You can see why the campground is named Jumbo Rocks, eh?

We also played with the barn door tracker and got some great Milky Way, dark site shots of 2 to 5 minutes in duration. As long as one carefully aligns the hinge on the tracker with the north celestial pole, you can get exposures this long without stars bloating or streaking. I accomplish this by laying a Celestron 9x30 finderscope on the hinge, and putting the crosshairs about 1/2° off of Polaris in the direction of the Big Dipper. This is accurate enough alignment to get the 2 to 5 minute exposure with a wide angle lens; as the focal length increases (and field of view decreases) tracking stars to pinpoints becomes much more problematic, similar to tracking with a 450mm f/6 wide field refractor vs. a 2000mm f/10 SCT.

The first image below shows one of the barn door tracked images. This is the central summer Milky Way, with Deneb near center and Cygnus stretching to the bottom of the picture; Vega and Lyra is visible in the upper right hand corner. The faint outline of the North American Nebula is starting to materialize just above Deneb. This image was tracked for 3 minutes, at f/3.5 ISO 800. Since I was going for a longer image, I stopped up the aperture a bit so I could pump up the ISO without additional sky glow. The image turned out acceptable, although some noise is visible, especially since it is a .jpeg straight from the camera without any processing.

Joshua Tree Milky Way and Cygnus. Photo by Joe Lopinot.

The second barn door tracked image is for 2 minutes, @ f/2.2 with an ISO of 200. This one is interesting because I captured both the Andromeda Galaxy and the double cluster in Perseus in a single wide field image. Note the two clusters between Cassiopeia in the upper left and Peseus in the center, bottom.

Cassiopeia and Perseus from Joshua Tree National Park. Photo by Joe Lopinot.

I have included a couple of other interesting shots I took that evening and the next morning. The Perseid meteor shower at Joshua Tree National Park – alone or together, highly recommended! **RBAC**

Joshua Tree at twilight. Photo by Joe Lopinot.

Meteor over Joshua Tree National Park. Photo by Joe Lopinot.

Review of TeleVue 24mm Panoptic Eyepiece

By Bill Breeden
October 5, 2010

I have been collecting eyepieces for 6 ½ years, basically since I bought my Meade 8 inch LX90 Schmidt-Cassegrain (SCT) telescope. The hunt for the perfect eyepiece is never over; just ask any amateur astronomer. However, with the recent addition to my eyepiece case, I just may be that much closer to the perfect eyepiece collection.

My first eyepiece came with my telescope, the ubiquitous 26mm Meade Series 4000 Plossl. This eyepiece remains one of my favorites, and it is easy to see why Meade bundles this eyepiece with the telescope. It has the typical 50° apparent field of view of a Plossl, which is actually quite generous and comfortable. Building on this eyepiece, I soon acquired two more eyepieces in the Meade Series 4000 line: the 12.4mm and 9.7mm.

Without spending too much time on my other eyepieces, I will briefly list them here: Orion Highlight Plossl 32mm; Orion Explorer II Zoom 7-21mm; Orion Expanse 20mm, 15mm, 9mm, and 6mm; and TeleVue Nagler 13mm. The 32mm Orion Highlight Plossl works quite well in my 90mm refractor, which I use primary for public outreach views of the Moon at Francis Park, and I bought the cheap zoom eyepiece just for public outreach.

The Orion Expanse series is actually quite good, especially for the price of less than $75 each. For years, the 20mm and 15mm were my primary eyepieces for dark-site observing.

At some point in the past three years, I decided to slowly build my dream eyepiece set, even though I had no idea what that would be. I consulted TeleVue's web site, and they have a selection of eyepieces specifically recommended for 8 inch SCTs. It seems that Al Nagler ("Uncle Al") had done all the legwork for me in selecting three perfect eyepieces for my telescope.

Why TeleVue?

The question as to whether or not to choose TeleVue eyepieces in the first place has come up several times, so I will address it here. My first real experience with TeleVue eyepieces came in June 2005 during a trip to Star Hill Inn in New Mexico. Sadly, this astronomy "hotel" is no longer in business, but at the time it was simply amazing. I did not bring my own telescope since I had reserved time on several telescopes there. The real kicker, however, were the eyepieces I got to use: They were all TeleVues. Naglers, Panoptics, Radians, Plossls, you name it – Star Hill Inn had them! In combination with the awesome dark skies in New Mexico, the views through these eyepieces left an ever lasting impression on me.

Another reason I chose to build a TeleVue eyepiece collection is simply this: I love visual astronomy. I enjoy nothing more than staring at a deep sky object through the eyepiece. My pleasures in life are simple, and this is one of them. Why should I save up to buy an eyepiece that's "almost" a TeleVue to save a few hundred dollars? I plan to spend time observing the night sky for the rest of my life, so I want the best – that is, the one everyone else is compared against – and that's TeleVue.

According to TeleVue's web site, I only need three eyepieces for my 8 inch SCT if I stay with 1.25 inch eyepieces. 2 inch eyepieces tend to be big and heavy, and I want my setup to stay as mobile as possible. The three TeleVue eyepieces recommended are the 24mm Panoptic, 13mm Nagler, and 10mm Radian. I already have the 13mm Nagler (see separate article), so I decided to pick up the Panoptic next.

First light came on the night of October 1, 2010 at Brommelsiek Park. I had intended to make it all the way to Danville, but traffic changed my mind. The first object to grace the field in this eyepiece was the Double Cluster in Perseus (NGC869 and NGC884).

TeleVue 24mm Panoptic eyepiece. Photo courtesy TeleVue.

WOW. I can see both clusters in the same field! And SHARP – stars in and around the cluster were absolute pinpoints. This sight was a joy to behold. Words cannot describe the view. I compared the view with my 20mm Orion Expanse eyepiece (66° apparent field of view). This was my primary wide view eyepiece up until now. The view was nice, but I must say that the view in the Panoptic absolutely blows it away! The difference between the two views is simply amazing! The 24mm Panoptic is also very comfortable to look into. It feels very natural to the eye – you simply walk up to the scope and take a look. There is no blackout, no fuzzy edge, no tilting your head "just so," and no wondering how close to the eyepiece you need to be. It's so comfortable in fact, that it seems to disappear so that there is nothing between your eye and the magnificent object you are looking at.

I got a chance to compare the views to several eyepieces, both wide angle ones and Plossls. The Double Cluster is a beautiful object no matter what you use to view it, but it is absolutely stunning in the Panoptic. I see why Al Nagler suggests this as the low power eyepiece for 8 inch SCT's. The differences with other good eyepieces are subtle, but they add up to a substantial difference.

Brommelsiek Park is not the darkest location around, so I next moved the telescope to 31 Cygni, one of my favorite double stars in a very striking part of the Milky Way. I took a look through the Panoptic. WOW – the sharpness all the way across the field, the colors, the wide field, the beauty, the ease of viewing: Words just cannot describe the view!

Next was M31, the Andromeda Galaxy. HOLY SMOKES, I could see the whole galaxy, and M110 and M32 companion galaxies were remarkably clear. No color, but what a beautiful sight indeed, with the Panoptic's wide 68° sharp field encircling the view. I cannot wait to see what M31 looks like from a really dark location through this eyepiece.

I next moved the telescope to Jupiter, which had risen quite high in the south. I didn't expect a lot of detail in a low power eyepiece; planets are usually best viewed at medium power and higher for detail. However, the view of Jupiter through the 24mm Panoptic was nothing less than spectacular. The low power and wide field framed Jupiter and the four Galilean moons nicely, and Jupiter's disk was tack-sharp. Detail in the cloud bands, although small, stood out in stark sharpness. Is there anything this eyepiece doesn't do well? I am even excited about looking at the Moon through it!

I am extremely satisfied with the TeleVue 24mm Panoptic, and I would recommend that any 8 inch SCT owner give it serious consideration.

<u>TeleVue 24mm Panoptic Specifications</u>
68° Apparent Field
Model # EPO-24.0
Focal Length (mm) 24
Barrel Size (in.) 1¼"
Eye Relief (mm) 15
Weight (lb / oz) 0.51 / 8.2
Field Stop (mm) 27 **RBAC**

The Hunt for Exoplanets is On!

by **Carolyn Brinkworth**

The world of astronomy was given new direction on August 13, 2010, with the publication of the Astro2010 Decadal Survey. Astro2010 is the latest in a series of surveys produced every 10 years by the National Research Council (NRC) of the National Academy of Sciences. This council is a team of senior astronomers who recommend priorities for the most important topics and missions for the next decade.

Up near the top of their list this decade is the search for Earth-like planets around other stars—called "extrasolar planets" or "exoplanets" —which has become one of the hottest topics in astronomy.

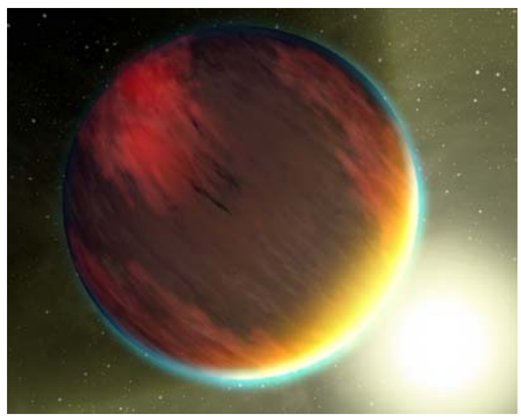
The first planet to be found orbiting a star like our Sun was discovered in 1995. The planet, called "51 Peg b," is a "Hot Jupiter." It is about 160 times the mass of Earth and orbits so close to its parent star that its gaseous "surface" is seared by its blazing sun. With no solid surface, and temperatures of about 1000 degrees Celsius (1700 Fahrenheit), there was no chance of finding life on this distant world. Since that discovery, astronomers have been on the hunt for smaller and more Earth-like planets, and today we know of around 470 extrasolar planets, ranging from about 4 times to 8000 times the mass of Earth.

This explosion in extrasolar planet discoveries is only set to get bigger, with a NASA mission called Kepler that was launched last year. After staring at a single small patch of sky for 43 days, Kepler has detected the definite signatures of seven new exoplanets, plus 706 "planetary candidates" that are unconfirmed and in need of further investigation. Kepler is likely to revolutionize our understanding of Earth's place in the Universe.

We don't yet have the technology to search for life on exoplanets. However, the infrared Spitzer Space Telescope has detected molecules that are the basic building blocks of life in two exoplanet atmospheres. Most extrasolar planets appear unsuitable for supporting life, but at least two lie within the "habitable zone" of their stars, where conditions are theoretically right for life to gain a foothold.

We are still a long way from detecting life on other worlds, but in the last 20 years, the number of known planets in our Universe has gone from the 8 in our own Solar System to almost 500. It's clear to everyone, including the Astro2010 decadal survey team, that the hunt for exoplanets is only just beginning, and the search for life is finally underway in earnest.

Explore Spitzer's latest findings at http://www.spitzer.caltech.edu. Kids can dream about finding other Earths as they read "Lucy's Planet Hunt" at http://spaceplace.nasa.gov/en/kids/storybooks/#lucy.



Artist's rendering of hot gas planet HD209458b. Both the Hubble and Spitzer Space Telescopes have detected carbon dioxide, methane, and water vapor—in other words, the basic chemistry for life—in the atmosphere of this planet, although since it is a hot ball of gas, it would be unlikely to harbor life.

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

Looked Up Lately?

Enjoy these ready-made observing lists for November and December. These lists include brighter deep-sky objects that transit around 10:00 PM each month.

November Observing List

Prepared by Bill Breeden

Double Stars

________ 65 Piscium SAO 74295 Const. PSC Type DS RA 00 49.9 Decl. +27° 43' Mag. 6.3 6.3
________ Eta Cassiopeiae SAO 21732 Achird Const. CAS Type DS RA 00 49.1 Decl. +57° 49' Mag. 3.4 7.5
________ Gamma Arietis SAO 92680 Mesarthim Const. ARI Type DS RA 01 53.5 Decl. +19° 18' Mag. 4.8 4.8
________ Lambda Arietis SAO 75051 Const. ARI Type DS RA 01 57.9 Decl. +23° 36' Mag. 4.9 7.7
________ Psi 1 Piscium SAO 74482 Const. PSC Type DS RA 01 05.6 Decl. +21° 28' Mag. 5.6 5.8
________ Zeta Piscium SAO 109739 Const. PSC Type DS RA 01 13.7 Decl. +07° 35' Mag. 5.6 6.5

Messier Objects

________ M31 NGC224 Andromeda Galaxy Const. AND Type GAL RA 00 42.7 Decl. +41 16 Mag. 4.8
________ M32 NGC221 Companion of And Galaxy Const. AND Type GAL RA 00 42.7 Decl. +40 52 Mag. 8.7
________ M33 NGC598 Const. TRI Type GAL RA 01 33.9 Decl. +30 39 Mag. 6.7
________ M74 NGC628 Const. PSC Type GAL RA 01 36.7 Decl. +15 47 Mag. 10.2
________ M76 NGC650 Little Dumbbell Nebula Const. PER Type PN RA 01 42.4 Decl. +51 34 Mag. 10.1
________ M103 NGC581 Const. CAS Type OC RA 01 33.2 Decl. +60 42 Mag. 7.4
________ M110 NGC205 Const. AND Type GAL RA 00 40.4 Decl. +41 41 Mag. 9.4

Caldwell Objects

________ C001 NGC188 Const. CEP Type OC RA 00 44 24.00 Decl. +85 20 00.0 Mag. 8.1
________ C002 NGC40 Const. CEP Type PN RA 00 13 00.00 Decl. +72 32 00.0 Mag. 11.6
________ C008 NGC559 Const. CAS Type OC RA 01 29 30.00 Decl. +63 18 00.0 Mag. 9.5
________ C010 NGC663 Const. CAS Type OC RA 01 46 00.00 Decl. +61 15 00.0 Mag. 7.1
________ C013 NGC457 ET Cluster Const. CAS Type OC RA 01 19 06.00 Decl. +58 20 00.0 Mag. 6.4
________ C017 NGC147 Const. CAS Type EG RA 00 33 12.00 Decl. +48 30 00.0 Mag. 9.3
________ C018 NGC185 Const. CAS Type EG RA 00 39 00.00 Decl. +48 20 00.0 Mag. 9.2
________ C028 NGC752 Const. AND Type OC RA 01 57 48.00 Decl. +37 41 00.0 Mag. 5.7
________ C043 NGC7814 Const. PEG Type SG RA 00 03 18.00 Decl. +16 09 00.0 Mag. 10.5
________ C051 IC1613 Const. CET Type IG RA 01 04 48.00 Decl. +02 07 00.0 Mag. 9
________ C056 NGC246 Const. CET Type PN RA 00 47 00.00 Decl. -11 53 00.0 Mag. 8
________ C062 NGC247 Const. CET Type SG RA 00 47 06.00 Decl. -20 46 00.0 Mag. 8.9
________ C065 NGC253 Sculptor Galaxy Const. SCL Type SG RA 00 47 36.00 Decl. -25 17 00.0 Mag. 7.1
________ C070 NGC300 Const. SCL Type SG RA 00 54 54.00 Decl. -37 41 00.0 Mag. 8.1
________ C072 NGC55 Const. SCL Type SG RA 00 14 54.00 Decl. -39 11 00.0 Mag. 8.2
________ C104 NGC362 Const. TUC Type GC RA 01 03 12.00 Decl. -70 51 00.0 Mag. 6.6
________ C106 NGC104 47 Tucana Const. TUC Type GC RA 00 24 06.00 Decl. -72 05 00.0 Mag. 4

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________ RASC110 NGC40 Const. CEP Type PN RA 00 13.0 Decl. +72 32 Mag. 10.2
________ RASC13 NGC253 Const. SCL Type G-Scp RA 00 47.6 Decl. -25 17 Mag. 7.1
________ RASC14 NGC772 Const. ARI Type G-Sb RA 01 59.3 Decl. +19 01 Mag. 10.3
________ RASC15 NGC246 Const. CET Type PN RA 00 47.0 Decl. -11 53 Mag. 8
________ RASC6 NGC185 Const. CAS Type G-E0 RA 00 39.0 Decl. +48 20 Mag. 11.7
________ RASC7 NGC281 Const. CAS Type EN RA 00 52.8 Decl. +56 36 Mag. -
________ RASC8 NGC457 ET Cluster Const. CAS Type OC RA 01 19.1 Decl. +58 20 Mag. 6.4
________ RASC9 NGC663 Const. CAS Type OC RA 01 46.0 Decl. +61 15 Mag. 7.1

December Observing List

Prepared by Bill Breeden

Double Stars
________ 32 Eridani SAO 130805 Const. ERI Type DS RA 03 54.3 Decl. -02° 57' Mag. 4.8 6.1
________ Alpha Piscium SAO 110291 Al Rischa Const. PSC Type DS RA 02 02.0 Decl. +02° 46' Mag. 4.2 5.1
________ Alpha Ursae Minoris SAO 15384 Polaris Const. UMI Type DS RA 02 31.8 Decl. +89° 16' Mag. 2.0 9.0
________ Eta Persei SAO 23655 Miram Const. PER Type DS RA 02 50.7 Decl. +55° 54' Mag. 3.8 8.5
________ Gamma Andromedae SAO 37734 Almach Const. AND Type DS RA 02 03.9 Decl. +42° 20' Mag. 2.3 5.5
________ Gamma Ceti SAO 110707 Kaffaljidhma Const. CET Type DS RA 02 43.3 Decl. +03° 14' Mag. 3.5 7.3
________ Iota Trianguli SAO 55347 Const. TRI Type DS RA 02 12.4 Decl. +30° 18' Mag. 5.3 6.9
________ Struve 331 SAO 23763 Const. Type DS RA 03 00.9 Decl. +52° 21' Mag. 5.3 6.7
Messier Objects
________ M34 NGC1039 Const. PER Type OC RA 02 42.0 Decl. +42 47 Mag. 5.5
________ M45 Pleiades Const. TAU Type OC RA 03 47.0 Decl. +24 07 Mag. 1.6
________ M77 NGC1068 Const. CET Type GAL RA 02 42.7 Decl. -00 01 Mag. 8.9
Caldwell Objects
________ C005 IC342 Const. CAM Type SG RA 03 46 48.00 Decl. +68 06 00.0 Mag. 9.2
________ C014 NGC869/884 Double Cluster Const. PER Type OC RA 02 20 00.00 Decl. +57 08 00.0 Mag. 4.3
________ C023 NGC891 Const. AND Type SG RA 02 22 36.00 Decl. +42 21 00.0 Mag. 9.9
________ C024 NGC1275 Per A Radio Source Const. PER Type IG RA 03 19 48.00 Decl. +41 31 00.0 Mag. 11.6
________ C067 NGC1097 Const. FOR Type SG RA 02 46 18.00 Decl. -30 17 00.0 Mag. 9.2
________ C087 NGC1261 Const. HOR Type GC RA 03 12 18.00 Decl. -55 13 00.0 Mag. 8.4
Royal Astronomical Society of Canada Objects
________ RASC10 IC 289 Const. CAS Type PN RA 03 10.3 Decl. +61 19 Mag. 12.3
________ RASC12 NGC891 Const. AND Type G-Sb RA 02 22.6 Decl. +42 21 Mag. 10
________ RASC16 NGC936 Const. CET Type G-SBa RA 02 27.6 Decl. -01 09 Mag. 10.1
________ RASC17 NGC869/884 Double Cluster Const. PER Type OC RA 02 20.0 Decl. +57 08 Mag. ~4.4
________ RASC18 NGC1023 Const. PER Type G-E7p RA 02 40.4 Decl. +39 04 Mag. 9.5
________ RASC21 NGC1232 Const. ERI Type G-Sc RA 03 09.8 Decl. -20 35 Mag. 9.9