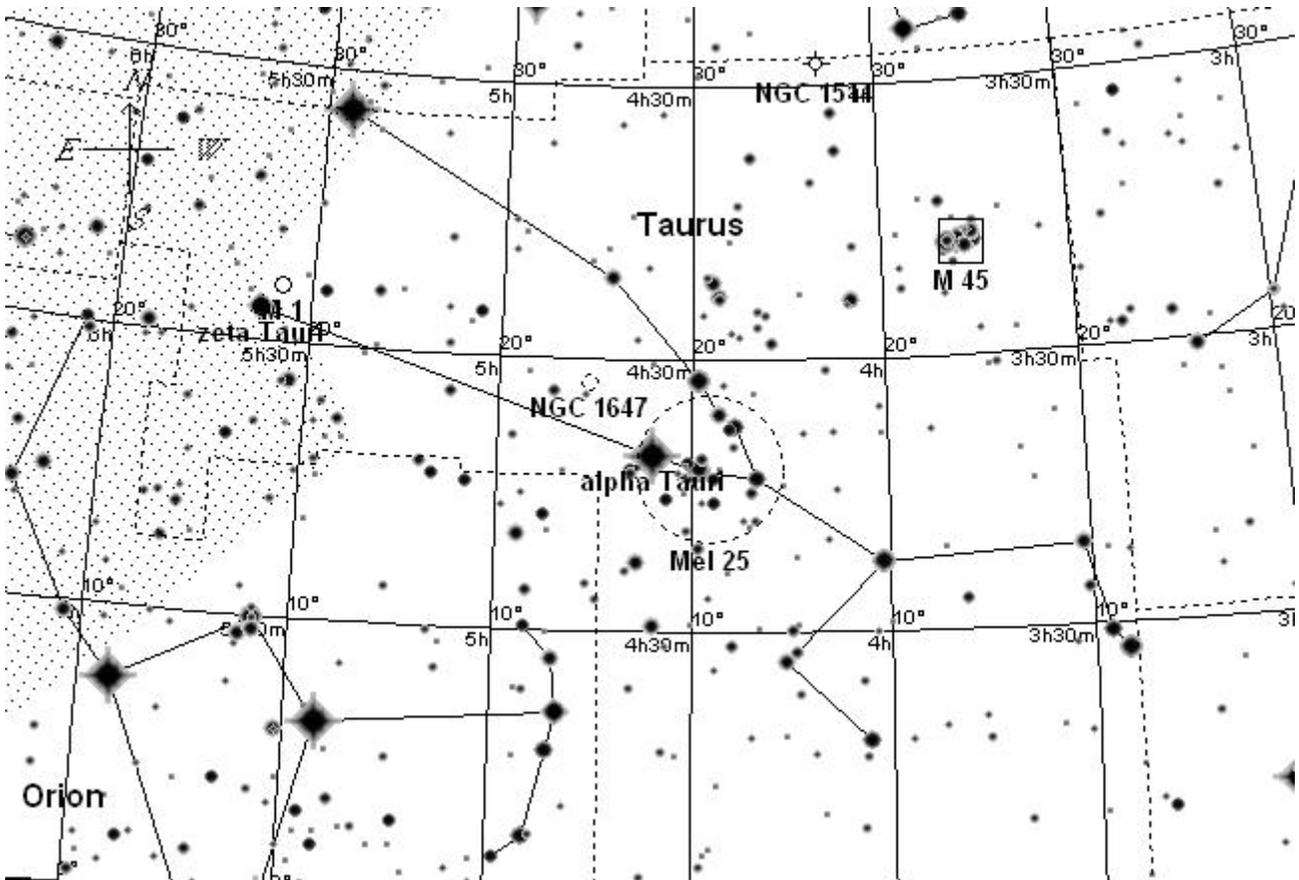


Small Wonders: Taurus

A Monthly Beginners Guide to the Night Sky

by Tom Trusock

A printable version can be found [here](#).



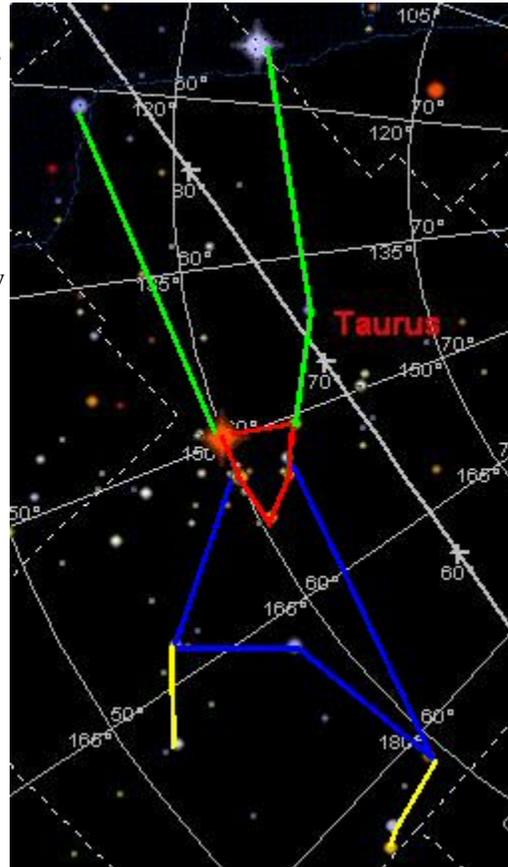
Wide field Chart

Target List	Name	Type	Size	Mag	RA	DEC
	alpha Tauri	Star		0.9	04h 36m 12.8s	+16° 31' 17"
	zeta Tauri	Star		3.0	05h 37m 56.9s	+21° 08' 51"
	M 45	Open Cluster	100.0'	1.2	03h 47m 18.1s	+24° 08' 02"
	Mel 25	Open Cluster	330.0'	0.5	04h 27m 17.4s	+16° 00' 48"
	NGC 1647	Open Cluster	40.0'	6.4	04h 45m 59.8s	+19° 07' 40"
	M 1	Supernova Remnant	6.0'x4.0'	8.4	05h 34m 50.1s	+22° 01' 11"
Challenge Object	Name	Type	Size	Mag	RA	DEC
	NGC 1514	Planetary Nebula	2.2'	10.9	04h 09m 36.2s	+30° 47' 29"

A SkyMap Pro Target List for these objects [is available](#).

For the last several thousand years, mankind has been a little bull-headed when it comes to Taurus. It has the distinction of being one of the oldest recognized constellations in the night sky. According to some records, it's been in this form for 4000 years or longer. In ancient times, the appearance of the sun in the celestial bull - a plow animal - marked the vernal equinox, and the beginning of spring planting.

Our constellation for the month is located on the edge of the winter Milky Way, and our targets include; three open clusters, one of the brightest supernova remnants in the night sky and a lesser known planetary nebula. By no means is this an exhaustive list of targets in Taurus - there are far more. Unabashedly this month's list is slanted towards the small scope owner. It's only fair, really, given the fact that last month's was slanted towards readers with larger scopes. Nearly every target this month can be seen in binoculars and at least two can be seen with no optical aid at all.



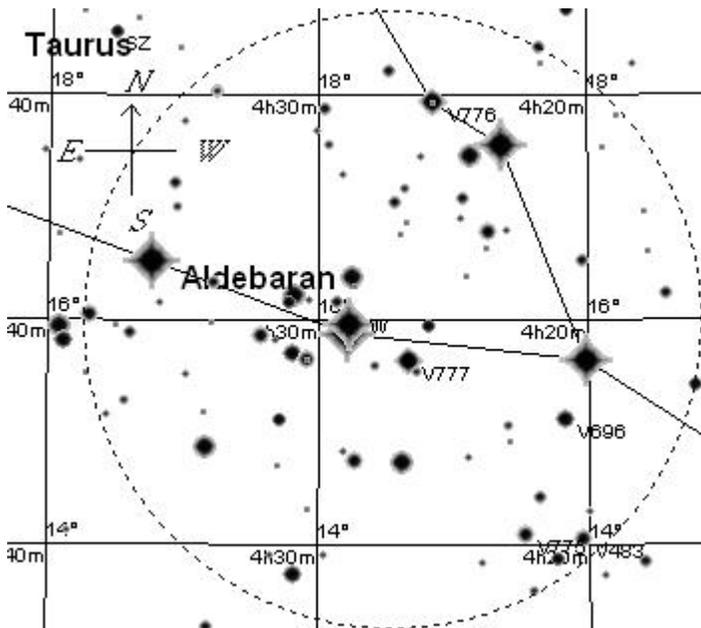
Although Taurus is lying on its side in the late fall, seeing the bull in this constellation merely requires a bit of stellar connect-the-dots. See the illustration to the right. One of the more spectacular naked eye clusters in the night sky - the Hyades - makes up much of the face of the Bull. The long horns extend towards the fringes of the winter Milky Way, and the body and legs to the south west. You can compare the figure I've sketched in with H.A. Rey's slightly more traditional form in the wide field image at top.

Taurus contains two of the most spectacular naked eye clusters in the night sky; the Hyades (Melotte 25 or the Taurus Moving Cluster) and the Pleiades (M45).

Mel 25 - Hyades and Aldebaran (Alpha Tau)



Hyades and Pleiades - Image courtesy Suk Lee



Before we go any further, take a moment and study Suk Lee's wonderful wide field shot of the Hyades and Pleiades. Look closely, and you can pick out the open cluster NGC1647 and the orange glow of Aldebaran (Alpha Tau) - other targets that are on the list for later this evening.

The Hyades and the Pleiades seem to be related. Not astrophysically, but in some versions of Greek mythology they

share a father - Atlas the Titan, condemned to hold the celestial sphere on his shoulders for eternity. One version of the legend relates they are sisters of Hyas who in deep sorrow after his death, themselves died and found a place in the sky. (Ironically enough, yet another legend says that the Pleiades died in sorrow after the deaths of the Hyades.)

While Aldebaran is the brightest star in the constellation Taurus, and as such the brightest star in the Hyades, it's actually not a member of the open cluster. But it's still somewhat famous in it's own right.

Those who are fans of H.P. Lovecraft's Cthulhu Mythos will immediately recognize that Cthulhu's half brother, Hastur the Unspeakable (also known as "Him Who is not to be Named") dwells near Aldebaran in alliance with the Byakhee (winged creatures which dwell in the depths of space - also near Aldebaran).

Trivia - Aldebaran is the brightest star that the moon occults.

The fearsome Old Ones aside, Aldebaran marks the Bull's right eye, and its name is derived from the Arabic word Al Dabaran, meaning follower - most likely a reference to the way this bright star follows the Pleiades. Hipparcos data places it at 65.1 light years - slightly under 1/2 the distance to the Hyades proper. Aldebaran is a large K5 star, obviously orange in color - even to the naked eye. Shining at 150 times the sun's brightness, it's relative closeness to Earth translates it into the 13th brightest star in the night sky. Aldebaran is thought to have a large planetary companion which masses around 11 Jupiters and orbits at a distance of 1.35 AU.

The Hipparcos satellite determined that the center of mass for Mel 25 (the Hyades) lies about 151 light years from Earth, and we know it's age to be somewhere on the order of 625 million years. To large for most telescopes, the Hyades is perhaps best scanned in a very low power binocular field or naked eye.

M45 - the Pleiades

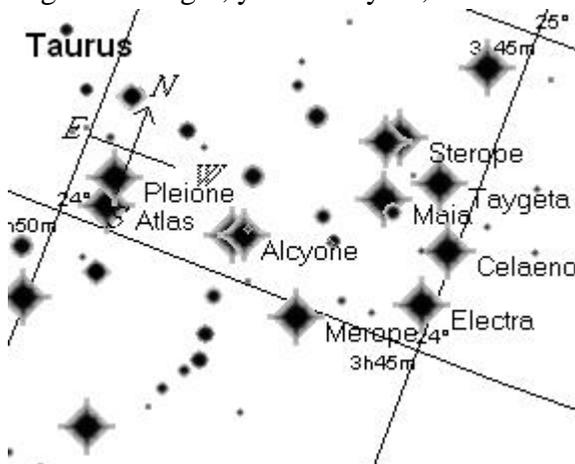
An easy naked eye object, binoculars or a small rich field scope will show the cluster to it's best advantage.

The Pleiades ancestry seems a bit more clear cut. The daughters of Atlas and Pleione won their way into the night sky as a boon from Zeus. After Pleione and her daughters were attacked by Orion, they escaped and were granted refuge in the stars.

Night after night, year after year, Orion tries fruitlessly to catch them.



M45 Image Courtesy Tony Licata



The Pleiades lie around 400 light years from earth, and are only 1/10 the age of the Hyades. Do the Hyades look old and yellow and the Pleiades young and blue? They should...

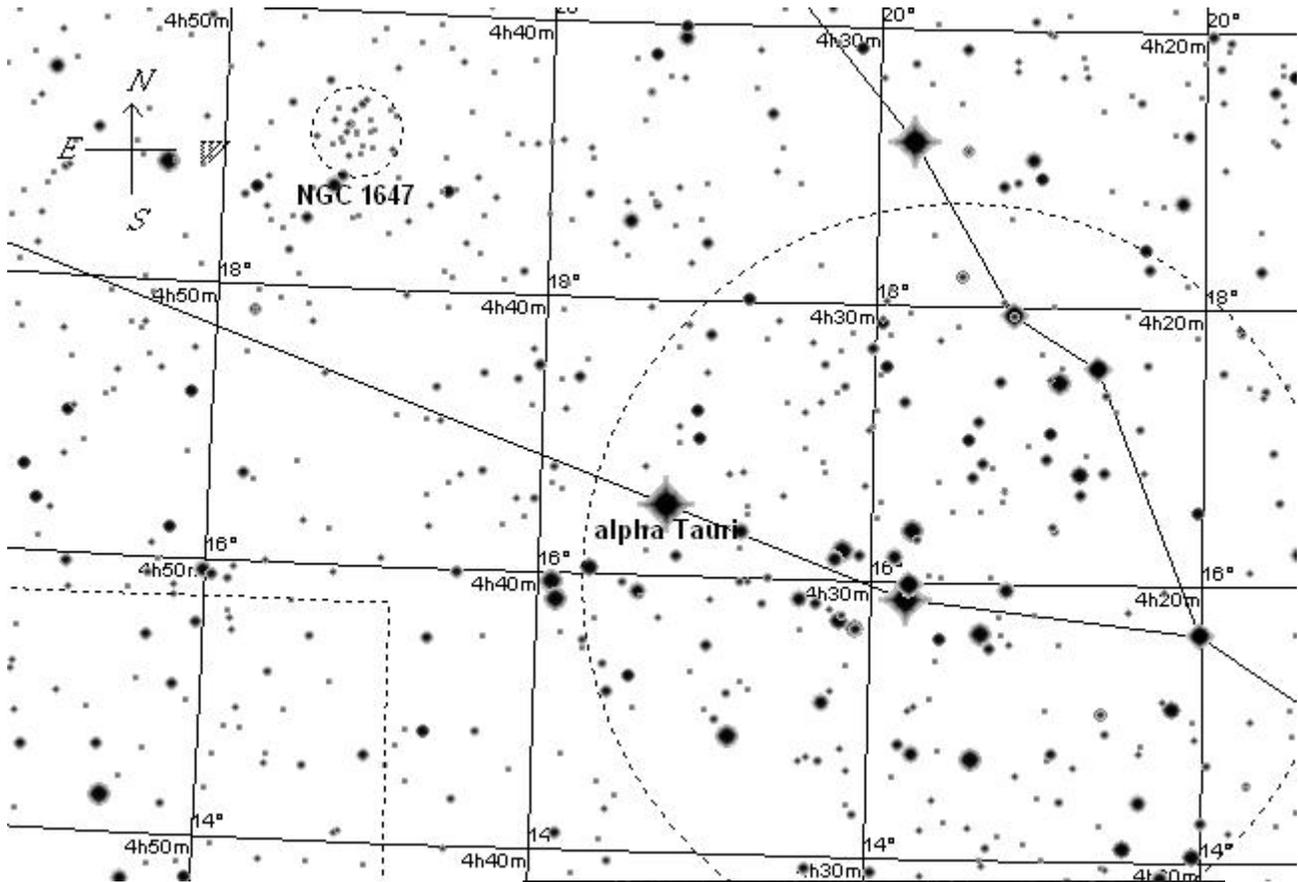
The Pleiades are also referred to as the Seven Sisters, undoubtedly a reference to what people have historically considered the number of stars easily visible. Steven O'Meara (*The Messier Objects*) notes that there are far more stars than this visible to

the careful naked eye observer. A check of SkyMap Pro shows 11 stars visible at mag 6 or brighter, and 22-24 at mag 7! O'Meara puts the number of stars visible to the careful observer under dark skies as somewhere between 12 - 18, other sources somewhat less. The best I've managed is a mere 13 under the transparent dark skies of Michigan's Northern Lower Peninsula.

As to the naked eye sightings of large numbers of the Pleiades, what may complicate the matter is the debate over the visibility of the nebulosity that runs throughout M45. Some say it's easily visible, others think it's not and what people are actually seeing and taking for nebulosity is the light of unresolved stars in the open cluster. Naked eye visibility aside, I've found that my 4" refractor is better at showing the nebulosity throughout the cluster than many of my larger scopes. Aperture isn't necessarily the key here - rather transparent skies and good equipment that provides a view with low amounts of scatter and high contrast. When embarked on your own investigation into the Pleiades nebulosity use low powers. Pay careful attention to the area around Merope - where the brightest swatch of nebula resides (the Merope Nebula). On a good night you may see nebulosity throughout the cluster. Be aware that a slight amount of dew on the optics can produce a very similar effect to faint nebulosity, so be sure to inspect your equipment. I'd recommend that if you think you spot the nebula swing your scope over to the Hyades and look carefully there. If you spot nebulosity in the Hyades, it's due to scatter or moisture on your optics and you probably haven't really seen the reflection nebula associated with M45.

When you turn your scope to M45, make sure you use low powers to frame the cluster to its best advantage. How many of the stars can you name?

NGC1647



NGC1647 is a nice open cluster - bright and large - relatively speaking. While it can't hold a candle to naked eye observations of the Hyades and Pleiades, Archinal and Hynes (*Star Clusters*) state that it can be seen without optical aid from a dark site. I've never managed that, but found it to be quite satisfactory in a small telescope. Large telescopes typically don't provide a wide enough true field of view to do justice to this cluster.

Various reports across the net tend to dispute the visibility of the cluster - I've heard everything from naked-eye to not visible in binoculars. My own

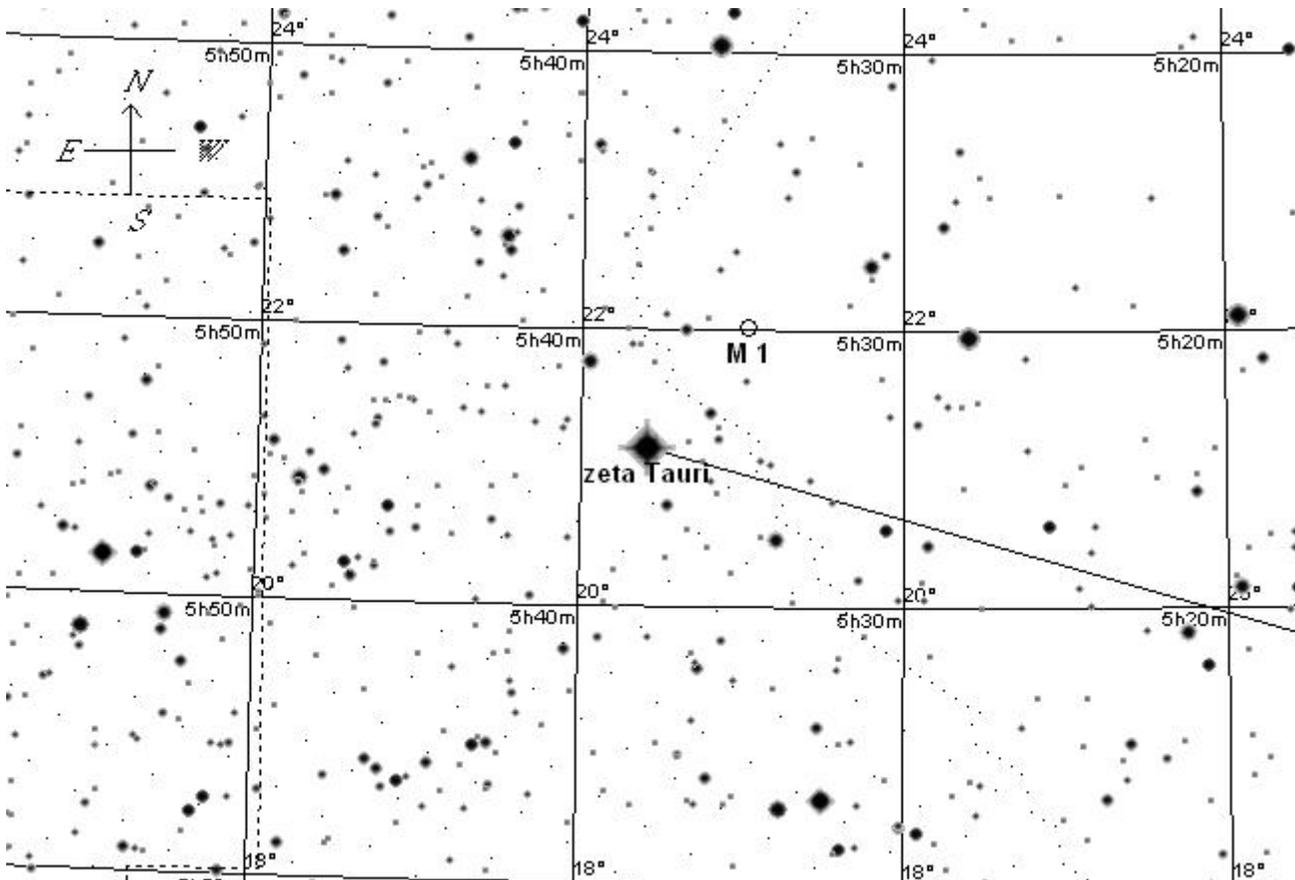


binocular investigations of this cluster have come up mostly dry - but then again, according to my notes, the only time that I really tried for it in bino's was when a mostly full, but waning moon was near by. I thought I detected a hint in a set of inexpensive 12x50's, but there certainly wasn't much there at all. NELM was around 3 that evening in that particular area of the sky (due to luna). What's the smallest aperture you can make the cluster out of? What's the smallest you see any resolution in?

To find this loosely scattered open cluster in a small telescope or binoculars, place Aldebaran in the center of a low power field of view and pan outwards from the Hyades in a NE direction. 1647 lies about 3.5 degrees NW of Aldebaran on a line that nearly bisects the V of the face of the Bull.

As an indoor exercise, be sure to examine Suk Lee's wide field shot above to see if you can locate this cluster. It's small and faint but it is in the image.

M1 - The Crab Nebula



"What caused me to undertake the catalog was the nebula I discovered above the southern horn of Taurus on Sept 12, 1758, while observing the comet of that year... This nebula had such a resemblance to a comet in its form and brightness, that I endeavored to find others, so that astronomers would not confuse these same nebula with comets just beginning to shine. I observed further with the proper refractors for the search of comets, and this is the purpose I had in forming the catalog..."

- Charles Messier (as quoted in Burnham's Celestial Handbook)

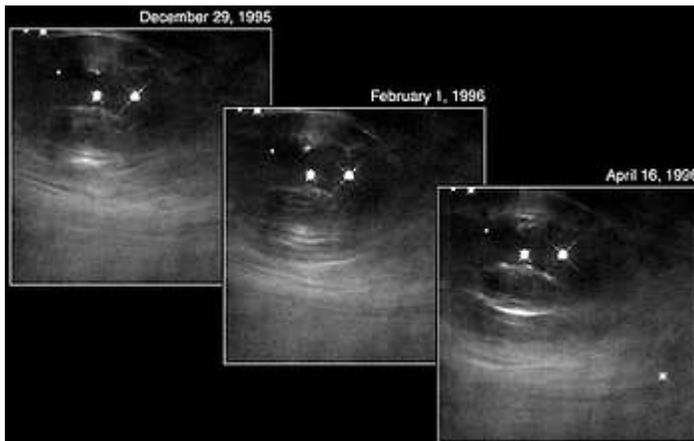
On July 4, 1054 AD, a red super giant exhausted its fuel and within seconds the core had collapsed to maximum density, shortly after gas rebounded off and the star erupted in one of the most violent explosions ever known - an explosion, that for one brief moment likely outshone the entire galaxy.

It's believed that astronomers across the world recorded this celestial event, from American Indian pictographs in northern Arizona to the dedicated observers of the Sung Dynasty. The supernova is reputed to have been visible in daylight for several weeks, and at night for a year. It would have been hard for a sky wise individual to miss.



Deep in the center of the Crab, 6500 light years away, lie the remains of its progenitor - a pulsar that rotates at 30 times a second. With a force that boggles the mind, the pulsars magnetic field grabs particles, accelerates them to near light speed and whips them out

into the surrounding nebula. Only six miles across, the pulsar is composed of degenerate matter and masses more than our sun. Time lapse photography with the Hubble space telescope shows that the interior of the nebula is more dynamic than nearly anyone had imagined - changes occur in a matter of days as the particles stream out at nearly half the speed of light. If you have a high



bandwidth connection, here's a [time lapse movie](#) (4.69 meg) from Hubblesite.org, made Hubble (optical) and Chandra (x-ray) photos of the pulsar. Download it, set your player to repeat and watch the heartbeat of the Crab.

Those of you without high bandwidth connections don't need to feel completely left out. Look left to see three Hubble/STSCI pictures of the region around the pulsar. These were taken successively about two months apart; December 29, 1995, February 1, 1996 and April 16, 1996. In that short a period of time, you can see that obvious changes have taken place.

I should note that the pulsar is probably a little beyond the reach of most backyard astronomers. In *The Messier Objects*, Steven James O'Meara reports seeing the pulsar in a 20 inch scope, but the only other reports I was able to find involved observations with scopes half again that size! Fortunately though, the nebula itself is of great interest to observers with, shall we say, more modest scopes.

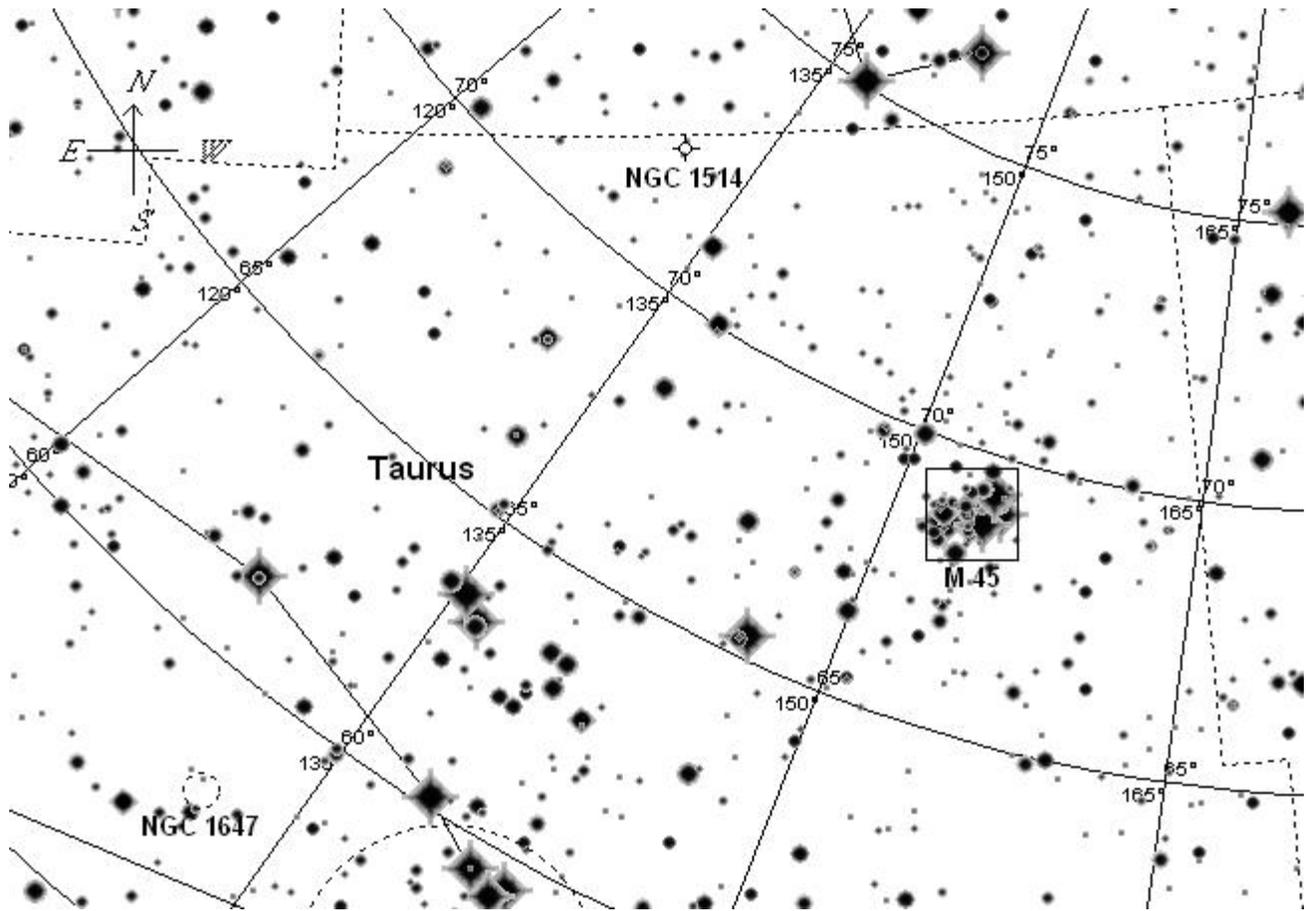
To find M1, use your lowest power eyepiece, and center your telescope on Zeta Tau. In small scopes, M1 and Zeta Tau can easily be seen in the same field. If it's not there, pan up towards the other horn just a bit, and perhaps back towards the Hyades. Look for a fairly small oblong puff of smoke. In the DSS image (Quick-V) shown above, both can be seen in a 1 degree field of view. Once found I typically put the fairly bright variable star Zeta (2.88 - 3.17) out of the field to better inspect the nebula. I've observed M1 with scopes of various apertures. When using scopes under 8 inches, I've found M1 to be something of an irregular misshapen blob, twice as long as its wide. While the edges

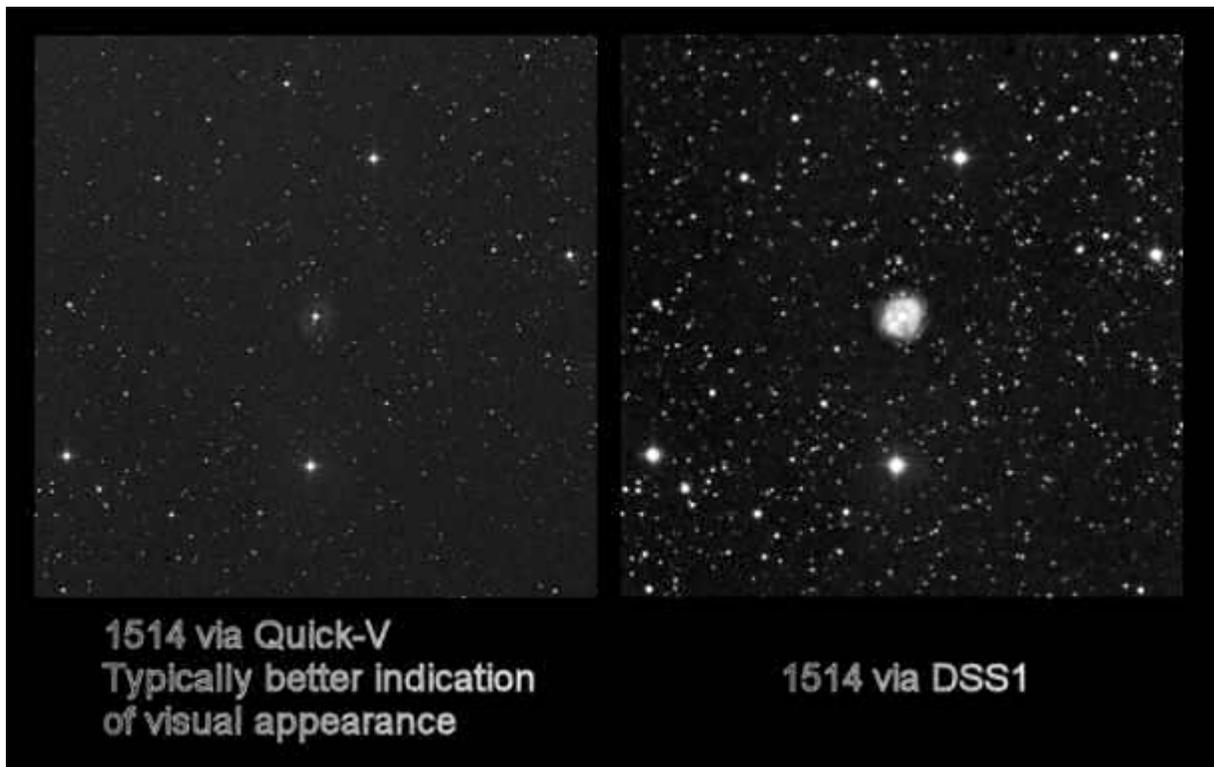


aren't straight, they don't typically show ragged filamentary structures until I apply a bit more applied - although on the best nights, all bets are off.

I've seen the Crab with scopes as small as 70mm, and didn't consider it a difficult object. With decent skies, I see no reason why one shouldn't be able to make an observation with the right set of binoculars. Have you seen the Crab in bins?

Challenge Object: NGC1514

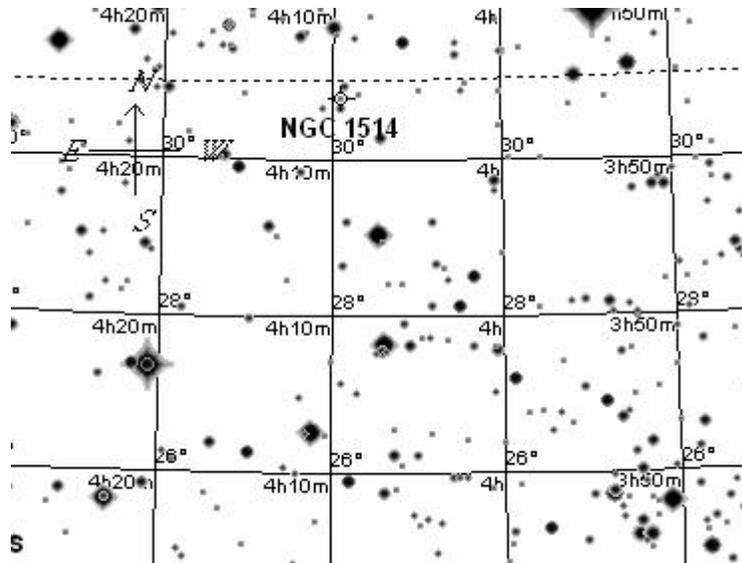




NGC1514 is the first object this month that you really can't grab in a standard set of binoculars, and thus a fitting challenge object to close out this month's tour. Its a fairly accessible planetary nebula (to a moderate sized scope anyway), but with a small twist. With many PN's, the challenge lies in finding and observing the central star - you won't have that issue with 1514. The central star shines at a bright 9th magnitude while the nebula is listed at 11th. The nebula is fairly large at around 1.5'-3' in size, but dim. In smaller scopes, look for a circular haze surrounding a 9th magnitude star flanked by two other stars of similar brightness - as depicted in the photo above.

The two images above both come from the MAST DSS (See Additional Reading). The one on the left is drawn from the Quick-V database, and the one on the right, from DSS1. Typically, I find Quick-V to give a better indication of what the object will look like visually. Designed to point the Hubble Space Telescope (among other things) the DSS is also a very powerful tool for the amateur astronomer.

While 1514 is visible in moderate aperture under dark skies with out any type of filter, I'd recommend a Ultra High Contrast filter like the Lumicon UHC or Orion Ultrablock. Especially if you are going for this planetary with a scope less than 8-10 inches.



Additional Reading:

The Official Cthulhu Mythos FAQ

<http://www.necfiles.org/part1.htm>

Planetary Nebula Observation Reports - Doug Snyder's BlackSkies.com

<http://www.blackskies.com/reports01.htm>

Hubble Captures Dynamics Of Crab Nebula

<http://hubblesite.org/newscenter/newsdesk/archive/releases/1996/22/image/a>

Time Lapse Movie of Crab Pulsar Wind

<http://hubblesite.org/newscenter/newsdesk/archive/releases/2002/24/video/a>

Mast DSS (Multimission Archive Space Telescope - Digitized Sky Survey)

<http://archive.stsci.edu/dss/>

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I'd love to hear of your experiences under the night sky - please feel free to

e-mail me or send any observing reports to: tomt@cloudynights.com

Please indicate if I can cite your observations in future columns.

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