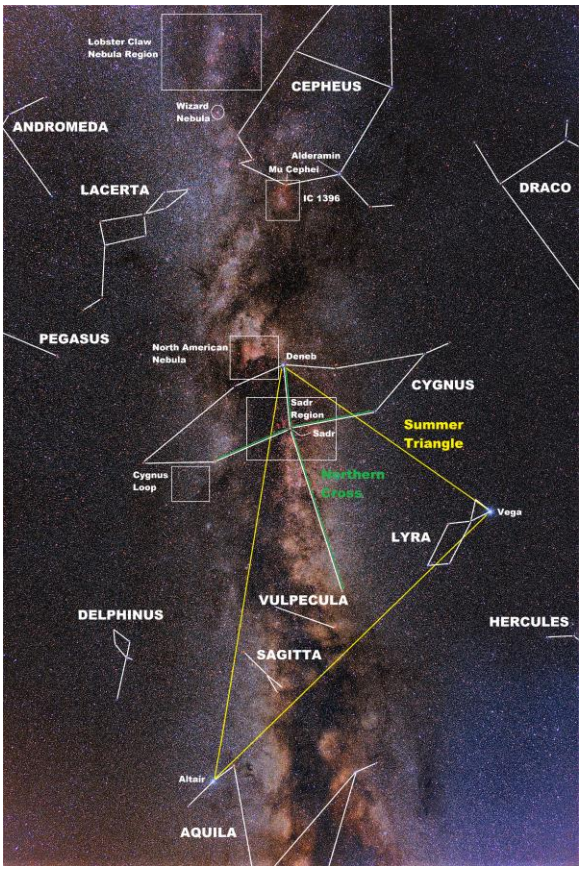
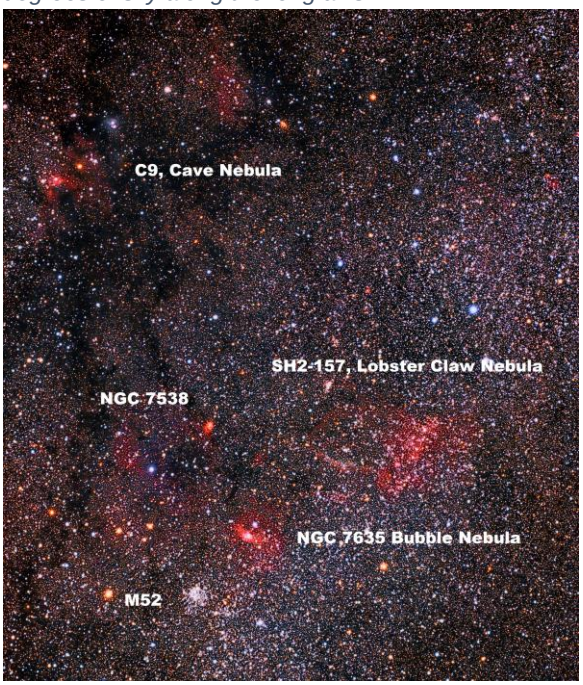



***Sadr Cygni** is at the center of this image, imaged with a 24mm Rokinon lens. The image show over 70 degrees of sky along the long axis.*




***Lobster Claw Region** imaged with a WO 250mm Redcat51.*

# Going Beyond the Veil

## By Dick Beam

I've often wondered what the night sky would have looked like to our predecessors years ago when they observed the heavens and what associations would they place on the them in relationship to their worship. Jewish faith has it that God told Moses how to construct a portable temple that could be moved from place to place to serve their pastoral lifestyle. There was a sacred room within the temple that separated what was called the Holy of Holies. Only the High Priest could enter this room at one time during the year (Lev. 16:1-19) and a veil was hung as an entrance to the Holy of Holies so that no one could see inside. In Exodus God instructs Moses how to make the veil:

"And you shall make a veil of blue and purple and scarlet material and fine twisted linen;" (Exodus 26:31)[i]

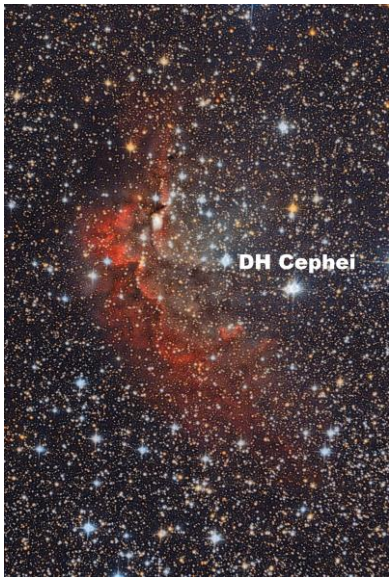
These are some of the colors of the heavens and so it's no surprise that the Israelites would want to adorn their temple with them. The constellation view[ii] to the left is loaded with such colors.

Let's start at the top of the constellation view, working down, and review some of the wonderful objects you can find here. The **Lobster Claw Region** has a mix of objects such as the star cluster **M52**. The beautiful **Cave Nebula** has a rich red emission nebula laced with white and nearby, blue reflection nebula.

Rare as they are, with a mere 500 discoveries within our galaxy, the **Bubble Nebula** represent one of two object to be shown here that are formed by what is known as a remnant of a Wolf-Rayet (WR)[iii] star, a star about 20 times our sun's mass that has shed all its hydrogen and fuses heavier elements to keep the star burning until it's finally burnt out. About half of the known WR stars are binaries, with one star cannibalizing the other.

Layered in the foreground of almost every image shown in this article is the murky dark nebula that we often peer through when observing the Milky Way; it's simply everywhere we look and it's pretty close as most of it that we can see and detect is around 500 light-years distant. Since the nebula is dark, it's harder to detect; in many cases we don't even know that it's there unless there's something behind it for its darkness to intrude.

***Cave Nebula*** *on the left,* ***Bubble Nebula*** *on the right. Both images were shot with an Orion 1000mm, 10" Astrograph.*




***Wizard Nebula.*** *Imaged with an Orion 1000mm, 10" Astrograph.*

A little further down from the constellation view of the **Lobster Claw Region** is the **Wizard Nebula, NGC 7380**, a star forming region, with hydrogen emission nebula interspersed. As you can see, we're deep in the Milky Way here and the stars are everywhere.

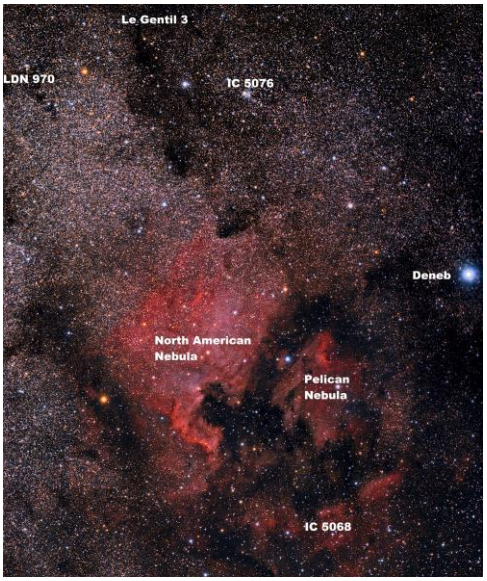
The driving force for the star formation and nebula that you see is a close binary system of two massive type-O stars (to the left of the image label), **DH Cephei**. The nebula radiates out from this star formation causing new stars to form in the rich, red regions and rifts of the nebula. Notice how some new stars align along the rifts.

The constellation view shows a region marked as **IC 1396**, located at the bottom of the constellation **Cepheus**, the king. This nebula occupies about 3 degrees of the sky. A full moon is a little over half a degree of sky for comparison. The nebula is primarily an emission nebula but there's an interesting feature within the nebula called the **Elephant Trunk**.


***IC 1396** and the **Elephant Trunk**. **IC 1396** was imaged with a WO 250mm Redcat51 and the trunk with an Orion 1000mm 10" Astrograph.*

The stars within the trunk are very young stars, perhaps only 100,000 years old, and the two stars that make up the cavity at the end of the trunk, the "nostrils," are about a million years of age and are thought to be responsible for emptying the cavity; these are very hot stars. The interaction of the red emission nebula with high solar-wind producing stars in the trunk contribute to its sharp edge.

In the constellation view, below **IC 1396**, lies a very lovely region crowned by the **North American Nebula**; it is probably one of the finest examples of dark nebula obscuring a very bright nebula, with both reflection and emission nebula within it.



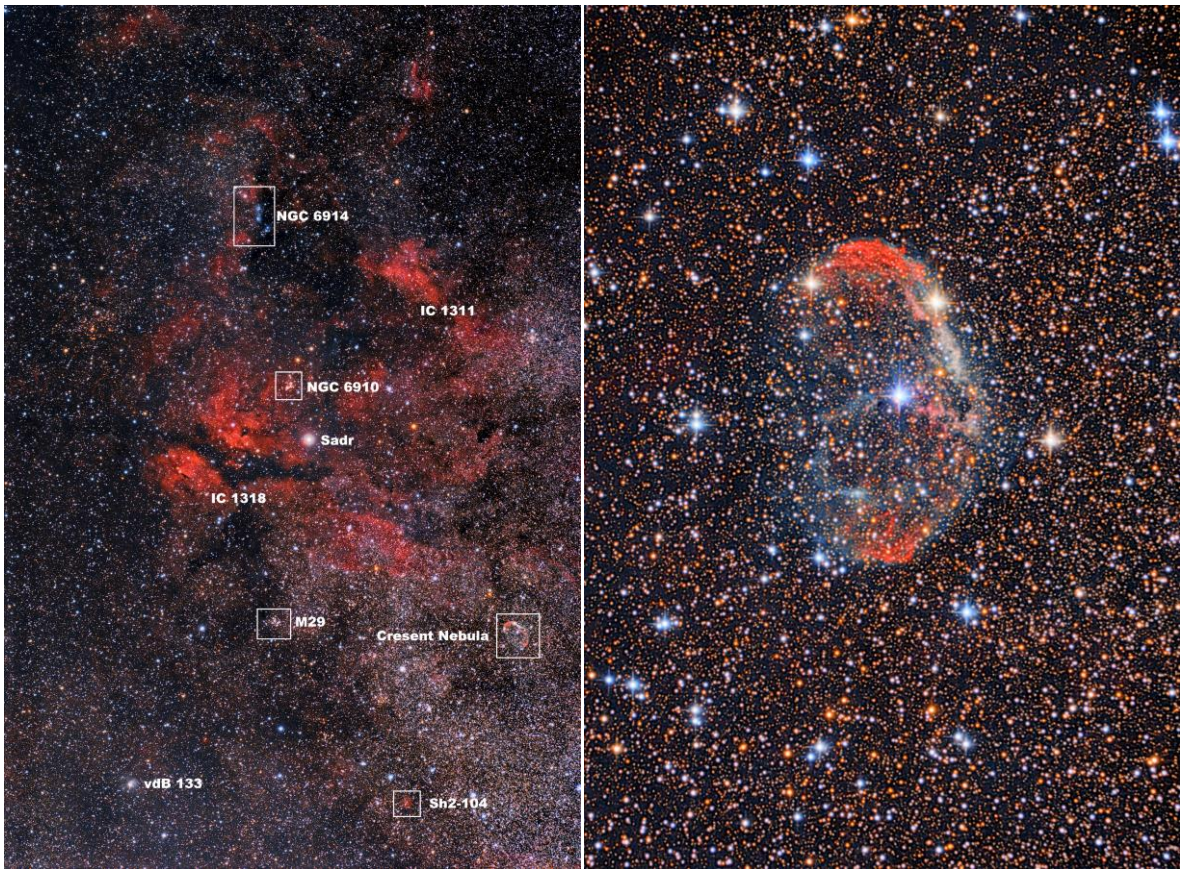

***North American Nebula Region** is shown above and imaged with a WO 250mm Redcat51. A more detailed view is shown on the next page. It is a mosaic of 3 images, imaged with a Tele Vue 660mm NP127is.*

What's interesting about the **North American Nebula** area is that the **Pelican Nebula** and **IC 5068** are all part of the **North American Nebula** but they've been classified as separate objects because of the dark nebula separating them.

My favorite view in this article is the mosaic I made of the **North American Nebula**, shown on the next page. Down around the "Mexico, US Border", with the "continent" on its side, there's a beautiful pillar of nebulosity that looks like one of the Pillars of Creation in the Eagle Nebula. Look at the subtle way the dark nebula forms like black lace over the stars. Some brighter stars peek through in the dark nebula as it thins in some places.

Notice that the image to the left is redder than the mosaic as it was shot with a sky-glow filter and the mosaic was shot without any filters. Quite often there are nebulas that have both emission, red and reflection, blue together and sometime only a little difference in the way the imaging was done can result in dramatically different results. Look at all the stars on the mosaic! By God, we're not alone.

**Going Beyond the Veil**




***Sadr Region*** *on the left imaged with a WO 250mm Redcat51.* ***Crescent Nebula*** *on the right imaged with an Orion 1000mm, 10" Astrograph.*

You will notice in the constellation view the constellation of **Cygnus**, the swan and the star, **Sadr**, which means chest in Arabic, is the center star in the image. The swan is flying down in roughly the direction of the Milky Way, it's neck way outstretched in front. If you turn your orientation around from your 12 to your 6, you can pick out a 5 starred cross known as the **Northern Cross** and at the chest, or the heart of the cross, is a richly filled region of red emission nebula, with **Sadr** in the middle, a yellow-white star.

Down toward the lower right area of the **Sadr Region** image above is the **Crescent Nebula** and guess what it is: a Wolf-Rayet remnant. This remnant looks a lot different than the **Bubble Nebula** shown earlier but it comes from the same kind of star.

Follow the right arm of the **Northern Cross** to beyond its reach and you'll find an area swept with veiled nebulas from a supernova remnant that occurred 10,000 years ago, known as the **Cygnus Loop**. I wonder what this remnant would have looked like when Exodus occurred some 3,400 years ago. What would this have looked like when it happened, for that matter? We'll probably never know what it was like because it occurred before the written word.

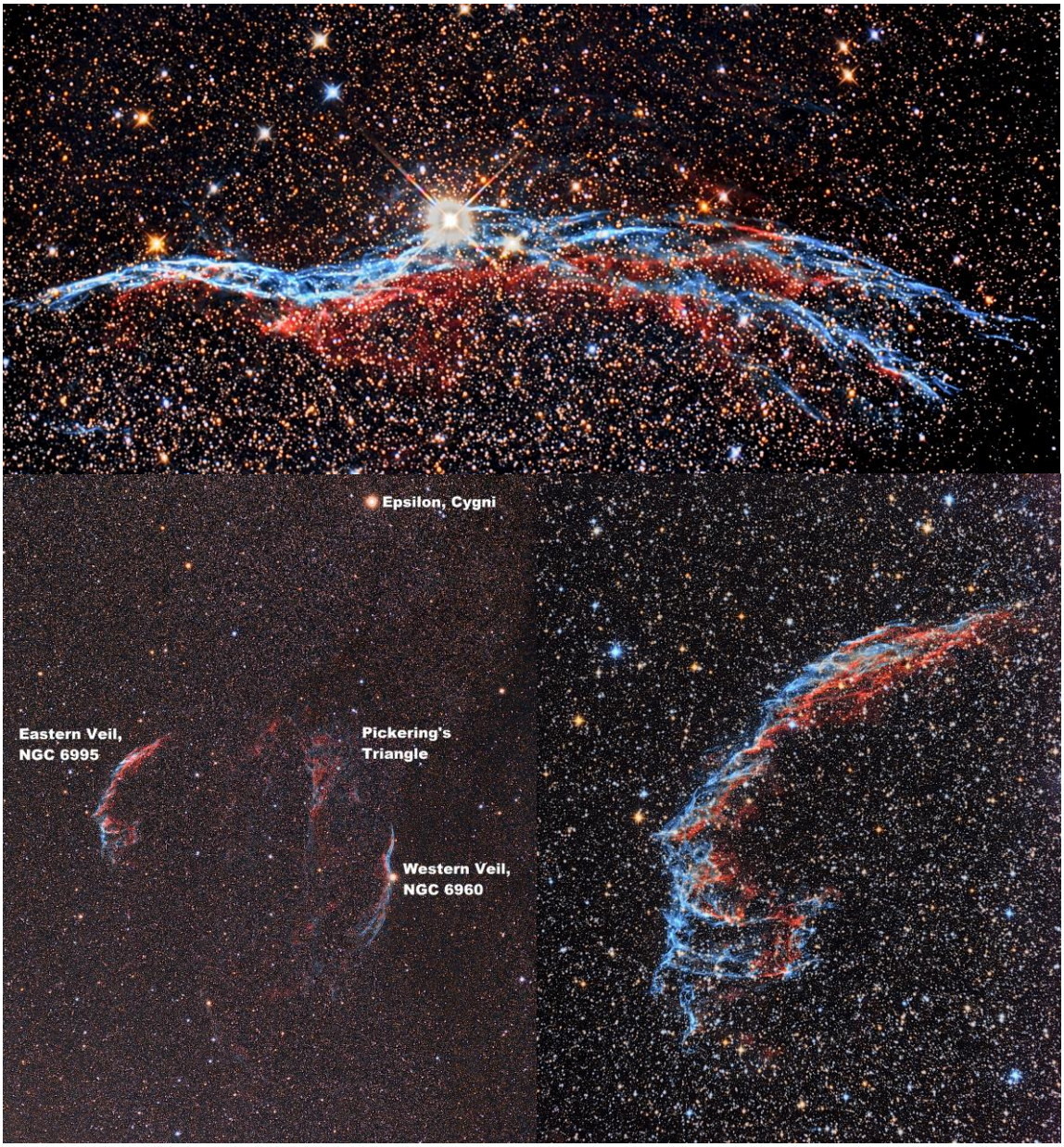
When Jesus died on the cross:

"And Behold, the veil of the temple was torn in two, from top to bottom," (Matt 27:51)

The celestial veils look pretty torn up to me.

The Western Veil was discovered and named by William Herschel, who attended a noted Christian School, Garrison School in Hanover, that required religious studies but he wasn't a particularly devout

man. The colors of the Biblical Veil are in the **Cygnus Loop**, though. William discovered the **Western Veil** by observing the nebulosity around its central star, 52 Cgyni, shown in two of the images below.

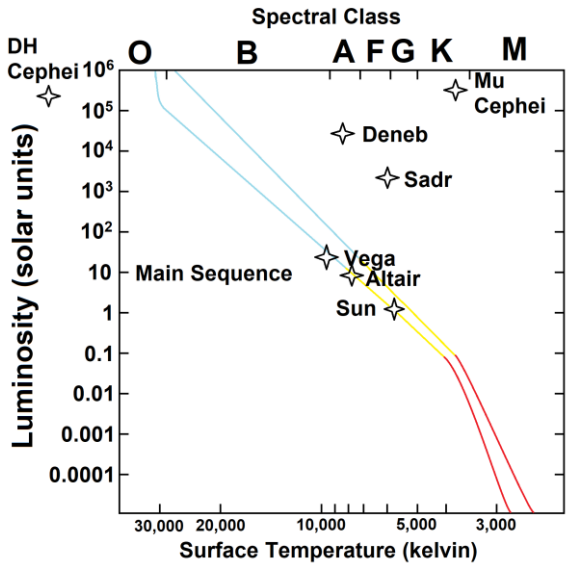



*Clockwise from the top: **Western Veil**, **Eastern Veil**, and **Cygnus Loop**. The **Cygnus Loop** was imaged with a WO 250mm Redcat51 and the veils with an Orion 1000mm, 10" Astrograph. **Epsilon Cygni** is the hand star of the right arm in the **Northern Cross**.*

I think I like the **Eastern Veil** the most because it has so much delicate structure in it. One can only imagine the incredible number of stars in these images. There are tens of thousands of stars in the veil images above, not including the Cygnus Loop image where there are vastly more.

In this article, I think the most unusual star system is **DH Cephei**. This stellar combination is off the chart of the HR Diagram[iv] shown below (a plot of star luminosity versus temperature, with most stars plotting

within the main sequence boundaries), with a whopping 48,000K surface temperature. That this close binary system could fuel a whole star cluster into existence is amazing to me.




*H-R Diagram for some stars in the constellation view.*

**Mu Cephei**, sometimes called **Herschel's Garnet Star**, was another surprise, with its great luminosity, yet cool surface temperature. There are stars classified giant stars and there are super giants; this star is a supergiant. What would this star have been like in its younger days must have been incredible because, as a star ages, it's surface temperature becomes less. With all things being the same, this star would have had to have been much brighter and have a very high surface temperature; perhaps it would be off the chart on both axis.

**Vega** is a disappointment because I always thought that since it was the second brightest star in the northern hemisphere, next to Arcturus, that it would be a blue giant but it falls pretty much into the main sequence.

There are three stars in the constellation view that make up the **Summer Triangle** asterism: **Vega**, **Altair**, and **Deneb**. There's a Winter Triangle too.

In the Biblical sense, the Veil, as it progressed through its existence, represent the old way of atoning for sins. The High Priest could only enter through the Veil on the Day of Atonement to offer animal sacrifice within the Holy of Holies. The tearing of the veil signals it's forthcoming destruction. Going beyond the veil is a matter of following Jesus, using the Holy Spirit as your guide:

"For Christ did not enter a holy place made with hands, a mere copy of the true one, but into heaven itself, now to appear in the presence of God for us." (Heb. 9:24)

Going beyond the veil temporally, we've got a lot of exciting things in front of us. I'm pretty amazed at what's been done with ground-based scopes just in this century. The James Webb Telescope will be deployed in December 2021 and it will have a field of view fifteen times as large as Hubble; it has a much more extensive range of light detection, well beyond the visible and into the infrared. The use of Very Long Baseline Interferometry in radio and optical arrays is very exciting to me and the implications of using such technology in space will allow us to make telescopes that can have magnifications in the thousands or more, limited only by the size of space and a clear field of view.

When we commune under the stars, and other people are around us or we're by ourselves, there's something about the heavens that transcends everything: we just all love the night sky and the common bond brings us together in ways we never thought possible, no matter what we believe or where we come from. We are both afraid of what the night sky might bring us, and transfixed by its beauty as we move, ever so slightly, beyond the veil that hides our understanding.

| Object | Type | Mag(v) | Size | Distance (ly) | RA | Dec |
|---|---|---|---|---|---|---|
| **Cave Nebula, C9** | Emission Nebula | 7.7 | 50'x30' | 2,700 | 22h57m38.6s | 62°43'54.6" |
| **Bubble Nebula, NGC 7635** | Emission Nebula | 11 | 15'x8' | 1,400 | 23h21m38.9s | 61°19'5" |
| **Wizard Nebula, NGC 7380** | Emission Nebula | 7.2 | 25'x30' | 8,500 | 22h47m51.4s | 58°12'49.1" |
| **IC 1396 & Elephant Trunk** | Emission Nebula | 5.59 | 3 degrees for **IC 1396**, 170'x140' for trunk | 2,400 | 21h39m45.8s[v] | 57°35'50.7" |
| **North American Nebula, NGC 7000** | Emission/Reflection Nebula | 4 | 120'x100' | 2,600 | 20h59m34.1s | 44°25'1.3" |
| **Crescent Nebula, NGC 6888** | Emission Nebula | 7.4 | 20'x10' | 5,400 | 20h13m17.0s | 38°28'53.0" |
| **Western Veil, NGC 6960** | Emission/Reflection Nebula | 5 | 3 degrees for **Cygnus Loop**, 70'x6' Western Veil, 60'x30' Eastern Veil | 2,600 | 20h46m35.3s | 30°47'43.2" |
| **Eastern Veil, NGC 6995** | Emission/Reflection Nebula | | | | 20h57m17.4s | 31°47'58.1" |
| **Vega** | Variable Binary Star | 0.02 | | 25 | 18h37m39.7s | 38°48'7" |
| **Altair** | Binary Star | 0.93 | | 16.7 | 19h51m49.2s | 8°55'23.8" |
| **Deneb** | Variable Binary Star | 1.33 | | 1,400 | 20h42m9.8s | 45°21'26.1" |
| **Sadr** | Binary Star | 2.23 | | 1,800 | 20h23m0s | 40°19'32.3" |
| **Mu Cephei** | Variable Binary Star | 4.01 | | 2,400 | 21h44m9.7s | 58°52'43.6" |
| **DH Cephei** | Variable Binary Star | 8.57 | | 11,000 | 22h47m45.5s | 58°11'52.5" |

**End Notes**

[i] The idea for the three Biblical verses in this article are from The Hebrew-Greek Key Word Study Bible, New American Standard, Revised Edition, 2008, pg. 115. See Key Note at the bottom of the page.

[ii] The constellation image was imaged using 47 frames of data shot over 4 nights. A tiltable platform was used to angle the camera 27 degrees to the horizontal. It is very important when shooting with a lens that has a shorter focal length than the camera's sensor, that you keep the camera to guide star relation throughout the shoot. Because of the Fisheye Effect, you will get image projection changes if you change this relationship slightly during the shoot and preprocessing programs may not be able to produce a good stack. Tripod balls are just not going to fly. A rigid platform where you can use another screw to jam nut the camera into the base, keeping it from swiveling, is a requirement if you want to get a precision image. The image registered and aligned hundreds of thousands of stars using only 500 of them, and it plate solved too, a process where stars in the image are compared with star locations in a database, so the image could be color calibrated photometrically.

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All imaging in this article was done with a Canon 6D, mkii, unmodified, and are the production and property of Dick Beam. Preprocessing was done using Deep Sky Stacker or Pixinsight. Processing was done in Pixinsight. Telescope mount is an Orion Atlas Pro AZ-EQ. The guide scope has a 240mm focal-length, with a 60mm aperture, using an Orion Star Shoot auto-guider camera, running PHD2 guide software.

[iii] There is actually another Wolf-Rayet star in the constellation view that I haven't had time to image. It is WR 124 in the constellation of Sagitta. There's a really nice image of WR 124 that Hubble took and you can find it online.

I would love to use the C14 Edge HD on my shop floor to image WR 124 and the **Bubble Nebula** but I need a couple of things. I'm on the inform-to-buy list for an AP1100, extended temp. absolute encoders, mount until next year because of COVID and another mount getting canceled. It's probably a really good thing the mount got canceled because the AP1100 is about the best mount of its class made. I'll need an observatory to put it in, ordered back on 2/21, that only faith and prayer is going to get it here at this point.

[iv] The prefix H-R is an acronym for Hertzsprung and Russell. These two astronomers discovered independently that plotting stars on a graph of luminosity versus surface temperature showed roughly 90% of them fall into a plot area known as the Main Sequence. The source information for the H-R Diagraming and these facts are from: Thomas T. Arny, Stephen E. Schneider, Explorations, an Introduction to Astronomy, 9th edition, International Student Edition, 2020, pg. 355-356.

[v] Use the same coordinates for the **Elephant Trunk** as **IC 1396**. The trunk extends inward to nearly the center of **IC 1396**