

Rockland Astronomy Club Presents: THE LEARN MORE SERIES



Learn more about Supernova Remnant

Supernova Remnants, or SNR's are the dramatic objects produced by the violent explosion of a massive star at the end of its life. This explosion, called a supernova, is one of the most energetic events in the universe, and causes a single star to briefly outshine the entire galaxy in which it is located. What we see as the remnant is the outward expanding shell of gas from the exploded star. Astronomers believe that supernovas occur in our galaxy roughly once every hundred years on average. SNR's are believed to be a key source for the distribution of the various elements found within the interstellar medium. The Big Bang produced very little material besides hydrogen and helium, yet we know that most of our planet is composed of other elements. These other elements were produced inside stars and during supernova explosions, and were disbursed into the interstellar medium by SNR's. It is also believed that the shock waves that occur from supernova explosions cause the collapse of the of the interstellar medium into the nebula clouds which then form new stars and thus closing the cycle of stellar evolution.



The NGC 6960 portion of the Veil Nebula

SUPERNOVA PROCESS

A supernova explosion will occur when there is no longer enough fuel for the fusion process in the core of the star to equalize the inward gravitational pull of the star's great mass. The star will swell into a red supergiant. On the inside, the core yields to gravity and begins shrinking. As it shrinks, it grows hotter and denser and a new series of nuclear reactions begin to occur. When the core has nothing left but iron, the fusion process ceases. In less than a second, the core temperature rises to over 100 billion degrees as the iron atoms are crushed together. The core compresses, but then recoils. As the shock encounters material in the star's outer layers the it propels the matter out into space. The Material that is exploded away from the star is now known as the Supernova Remnant. All that remains of the original star is a small, super-dense core composed almost entirely of neutrons; a neutron star. If the original star was very massive even the neutrons cannot survive the core collapse and a black hole will form.



The Crab Nebula M1

THE VEIL NEBULA

Ten thousand years ago, before the dawn of recorded human history, a new light must suddenly have appeared in the night sky and faded after a few weeks. Today we know this light was an exploding star and record the colorful expanding cloud as the Veil Nebula. Pictured above is the west end of the Veil Nebula known technically as NGC 6960 but less formally as the Witch's Broom Nebula. The rampaging gas gains its colors by impacting and exciting existing nearby gas. The supernova remnant lies about 1400 light-years away towards the constellation of Cygnus. The Witch's Broom actually spans over three times the angular size of the full Moon. The bright star 52 Cygnus is visible with the unaided eye from a dark location but is unrelated to the ancient supernova.

DID YOU KNOW? *The explosion of the Crab Nebula was witnessed by Chinese in 1064?*

It was recorded as being reddish-white with pointed rays in all four directions. It was said to be 6 times brighter than Venus, about as bright as the full moon, and visible during the daytime for over a month.

