AWESOME stories

Supernova Remnant E0102 in the Small Magellanic Cloud

This image, as described by NASA, depicts “Supernova Remnant E0102 in the Small Magellanic Cloud.”

What is a Supernova?

Every now and again a galaxy—like ours, which is the Milky Way—lights up because a huge explosion has occurred. That explosion happens when a supergiant—such as a massive star, much bigger than our Sun—meets a violent end.

We could say, in short, that a supernova is the explosion of a star. Insofar as we know today, it is the largest explosion which happens in space.

A supernova results when there is a change in the center of a star—in its core. NASA tells us there are two basic ways a star’s core can change:

> *The first type of supernova happens in binary star systems. Binary stars are two stars that orbit the same point. One of the stars, a carbon-oxygen white dwarf, steals matter from its companion star. Eventually, the white dwarf accumulates too much matter. Having too much matter causes the star to explode, resulting in a supernova.*
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> *The second type of supernova occurs at the end of a single star’s lifetime. As the star runs out of nuclear fuel, some of its mass flows into its core. Eventually, the core is so heavy that it cannot withstand its own gravitational force. The core collapses, which results in the giant explosion of a supernova.*

Do we have to worry that our Sun could become a supernova?

No ... because:

> *The sun is a single star, but it does not have enough mass to become a supernova.*

So what is left of the original star, after it explodes and becomes a supernova? NASA answers that question, too:

> *All that remains of the original star is a small, super-dense core composed almost entirely of neutrons - a neutron star. Or, if the original star is very massive indeed (say 15 or more times the mass of our Sun), even the neutrons cannot survive the core collapse...and a black hole forms.*
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> *The hot material given off by the supernova, the radioactive isotopes, and the free electrons moving in the strong magnetic field of the neutron star... all of these things produce X-rays and gamma rays. These high-energy photons are used by astrophysicists to study the phenomena of neutron stars and supernovae.*

What about the beautiful photo we see at the top of this page? What is it—and—where is it located?

NASA’s Image of the Day Gallery tells us more about this image:

In the nearby galaxy known as the Small Magellanic Cloud, a massive star has exploded as a supernova and begun to dissipate its interior into a spectacular display of colorful filaments, reminiscent of fireworks display.

The supernova remnant (SNR), known as "E0102" for short, is the greenish-blue shell of debris just below the center of this image from NASA's Hubble Space Telescope. This delicate structure, glowing a multitude of lavenders and peach hues, resides in the upper right of the image.

Determined to be only about 2,000 years old, E0102 is relatively young on astronomical scales and is just beginning its interactions with the nearby interstellar medium.

Young supernova remnants like E0102 allow astronomers to examine material from the cores of massive stars directly. This in turn gives insight on how stars form, their composition, and the chemical enrichment of the surrounding area. As well, young remnants are a great learning tool to better understand the physics of supernova explosions.

The Small Magellanic Cloud is a nearby dwarf galaxy to our own Milky Way. It is visible in the Southern Hemisphere, in the direction of the constellation Tucana, and lies roughly 210,000 light-years distant.

Click on the image for a spectacular view.

Credits:

Image, described above, by NASA, ESA, the Hubble Heritage Team (STScI/AURA) and J. Green (University of Colorado, Boulder).

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