

Triton Fun Company

Science Newsletter May 2007

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May 2007

A Brilliant New Type of Stellar Supernova !

T. Dockweiler

Special points of interest:

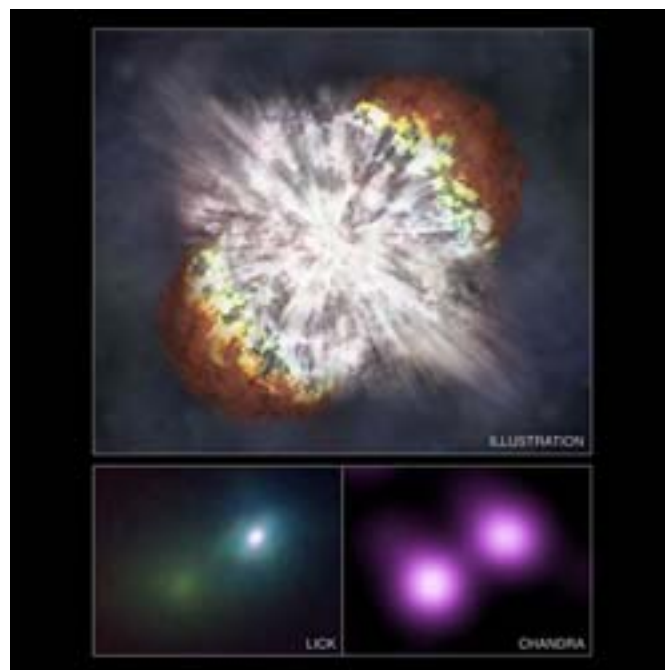
Supersized Supernova

Triton Fun stuff

Superfluous questions

Research on massive stars in our own Milky Way Galaxy over the last few decades has led to work on unusual objects like *Wolf-Rayet stars* (greater than 10-80 masses of our Sun with strong stellar winds). These were discovered spectroscopically by Charles Wolf and Georges Rayet in Paris in 1867; 342 known in our own Milky Way and nearby Magellanic Clouds. Also, *luminous blue variables* (100-150 masses of our Sun), *gamma-ray bursters* at cosmic distances, *binary neutron star collisions* which now appear to be the cause of many of those bursts [see the 2006 October article in *Nature*], and *magnetar flashes of gamma-rays*.

A recent paper by Ofek, et al. discusses research done on a supernova episode observed September 18, 2006 by the Texas Supernova Search group (initial notice *IAU Circular* 8754). It was first thought to be an active galactic nucleus. Further analysis with a NASA satellite (the Chandra X-Ray Observatory) and ground based adaptive-optics observations showed it to be the **largest and brightest stellar explosion in recorded history** and indicates evidence that it was the explosive death event of an extremely massive star.



Supernova SN2006gy

This provides theorized proof of an alternative ending for massive stars, not just the route forming a black hole. The explosion literally obliterated the star itself. In other words, it is a new type of supernova !

This event was **five times brighter than a normal supernova and 100 times more energetic**. Astronomers conducting the research were impressed by the brightness and length of time (70 days) that the event was visible. It peaked at 10 times the brightness of its host galaxy with the light equivalent of 50 billion times that of our Sun.

This new type of supernova fills a missing gap in stellar evolution charts on the life cycles of stars.

The massive star that produced the event is believed to be greater than 150 times more massive than our Sun. It is also believed to be a first generation star of a galaxy's formation which spew their elements by supernova into space later forming the raw materials for future generations of stars in galactic stellar nurseries.

We are always looking for **contributors** to the Science Newsletter. If you would like to write an article about a science subject you are excited about, or contribute a superfluous question, or if you would like to be on our **mailing list** for future newsletters, please e-mail us at:

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Biggest stellar explosion ever !, continued

Illustration credit (page 1): NASA/Chandra X-ray Center (CXC)/M.Weiss; X-ray: NASA/CXC/UC Berkeley/N.Smith et al.; IR: Lick/UC Berkeley/J.Bloom & C. Hansen; *The Chandra Chronicles*; (page 2): X-ray and Optical: NASA/CXC/ASU/J.Hester et al., A.Loll; IR:NASA/JPL/Caltech/U.Minn/R.Gehrz

It is theorized that galaxies first form with supermassive stars.

Black holes therefore may not be the only route taken by massive stars. This new type of event may be more frequent, particularly in the early age of the Universe. This type of explosion at the end of a star's life is conjectured to produce possible matter/antimatter emission of particles and gamma-ray light. Such stars producing such an huge event are very rare. About a dozen exist currently in our own Milky Way Galaxy which consists of 400 billion stars, half of which may be very small mass stars like brown dwarfs.

This gargantuan supernova event took place in a lenticular spiral galaxy designated **NGC 1260** at a distance of 76.6 megaparsecs from us (about 249.9 million light years away using the most recent data including the cosmic microwave background). The galaxy is also named **Abell 426** [Clusters of Galaxies by Abell], **UGC 2634** [Uppsala General Catalogue of Galaxies], and **HR4210** [Yale Bright Star Catalog (Harvard Revised Photometry Catalogue) later revised by Hoffleit]. The galaxy involved is of visual magnitude 14.3, as faint as planet Pluto, and was found by image subtraction. It is of an apparent angular size of 1.1 by 0.5 arc minutes.

The galaxy itself was discovered in 1884 by Guillaume Bigourdan (1851-1932) of France in the constellation Perseus in the northern celestial sky, just to the upper left of the star Algol. Bigourdan also found an asteroid, (390) Alma, on March 24, 1894. He later received the Gold Medal of the Royal Astronomical Society in 1919.

Many local bright stars in our stellar neighborhood were studied by Ellen Dorrit Hoffleit (1907-2007) who recently passed on in April (at age 100!). One relatively nearby star that she studied at 7,500 light years away is Eta Carinae in the southern celestial sky. It is possible that this star may take the same route as this new type of supernova event. Eta Carinae is about 120 times our Sun's mass and the most luminous in our galaxy.

The known Universe is currently believed to be 13.299 billion, or *giga-years* old with some estimates as high as 13.7 Gyr. The galaxy involved is 13.052 giga-years old and is traveling away from us with a redshift of 5,753 kilometers per second relative to the Sun.

It was believed that a protostar of great mass would lead to a blue supergiant (such as a luminous blue variable), which then would lead to a supernova and an eventual black hole. This new supernova takes the same evolutionary path, except that after the supernova explodes, a gaseous supershell is formed with significant quantities of radioactive nickel.



The Crab Nebula

The result of a supernova whose explosion was first seen on Earth in the year 1054 A.D. It was a star that was blasted to smithereens over 7000 years ago.

References:

1. **Ofek, et al.**, "SN 2006gy: An extremely luminous supernova in the Galaxy NGC 1260", *Astrophysical Journal - Letters*, 2007 April 10, pg. L13-L16
2. **Smith, N., et al.**, SN 2006gy: Discovery of the most luminous supernova ever recorded, powered by the death of an extremely massive star like Eta Carinae", *Astrophysical Journal, preprint, May 2007*
3. **The Chandra Chronicles:**
<http://chandra.harvard.edu/chronicle/0207/gentle/index.html>

See this website for more detailed info on this impressive supernova that's in a class by itself..

TRITON FUN PRODUCTS !

See our unique Sputnik 50th anniversary shirt: on sale now !

Our Triton Fun featured product this month is our incredibly interesting and unique **Sputnik 50th anniversary** shirt. This year of 2007 is the 50th anniversary of the launch of Sputnik 1 by the USSR in 1957. This was the first manmade object to go into space. Be the first kid on your block to be wearing this shirt celebrating the beginning of the space age. Order it at: <http://www.tritonfun.com> or call: 800-778-0560



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Magnetosphere hats



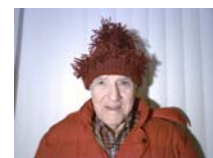
Sun visors -flippable



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** Send us your superfluous questions for a future issue ! They can be on any subject. The funnier, the better. M.D., our editor, appreciates the help and will send you a free Triton Fun coffee mug as compensation for your question. Or write an article for us and be read by professional and amateur astronomers and scientists in the U.S. and Canada ! **

Superfluous Questions:

1. Where was the element Californium first created ?
 - a) Lawrence Livermore Laboratory
 - b) University of California, Berkeley
 - c) University of California, Los Angeles
 - d) Disneyland
2. What are "bursa" ?
 - a) geological structures
 - b) dumplings in Croatian cuisine
 - c) fluid-filled sacs near muscles
 - d) financial administrators
3. In the TV show "*Early Edition*" (a classic !), who received *tomorrow's newspaper today* before Gary Hobson starting receiving it ?
 - a) Chuck Fishman
 - b) Patrick Quinn
 - c) Henry Paget
 - d) Lucius Snow
4. What U.S. state has the most Starbucks stores ?
 - a) New York
 - b) California
 - b) Texas
 - d) Florida

--> ANSWERS in next months issue of the Science Newsletter ! <---

** ANSWERS to April's Superfluous Questions: 1. a) Delaney 2. b) 1922 3. d) Continue rocking 4. b) line-up of planets