'King' of star explosions seen

by Bend_Weekly_News_Sources

AsÂ-troÂ-noÂ-mers have deÂ-tected the brightÂ-est stelÂ-lar exÂ-ploÂ-sion, or suÂ-perÂ-noÂ-va, on recÂ-ord. They say it may be a new type of suÂ-perÂ-noÂ-va that may also ocÂ-cur beÂ-fore long in our own gaÂ-lÂ-axyâ€”what one reÂ-searchÂ-er said would be hisÂ-toÂ-ryâ€™s most aweÂ-some star show.

The findÂ-ing comes from obÂ-serÂ-vaÂ-tions by NASAâ€™s ChanÂ-dra X ray ObÂ-servÂ-aÂ-toÂ-ry and ground-based teleÂ-scopes. It inÂ-diÂ-cates viÂ-oÂ-lent exÂ-ploÂ-sions of exÂ-tremeÂ-ly masÂ-sive stars were fairÂ-ly comÂ-mon in the earÂ-ly uniÂ-verse, sciÂ-enÂ-tists said.â€œThis was a truÂ-ly monÂ-strous exÂ-ploÂ-sion, a hunÂ-dred times more enÂ-erÂ-getÂ-ic than a typÂ-iÂ-cal suÂ-perÂ-noÂ-va,â€• said NaÂ-than Smith of the UniÂ-verÂ-siÂ-ty of CalÂ-iÂ-forÂ-nia at BerkeÂ-ley, who led a team of asÂ-troÂ-noÂ-mers in the reÂ-search. â€œThat means the star that exÂ-plodÂ-ed might have been as masÂ-sive as a star can get, about 150 times [the weight] of our sun. Weâ€™ve nevÂ-er seen that beÂ-fore.â€• AsÂ-troÂ-noÂ-mers think many of the first genÂ-erÂ-aÂ-tion of stars were this masÂ-sive, and this new suÂ-perÂ-noÂ-va may thus proÂ-vide a rare glimpse of how the first stars died.

The top panÂ-el is an artist's ilÂ-lusÂ-traÂ-tion that shows what SN 2006gy may have looked like if viewed from nearÂ-by. The botÂ-tom left panÂ-el is an inÂ-fraÂ-red imÂ-age from the Lick ObÂ-servÂ-aÂ-toÂ-ry, of NGC 1260, the galÂ-axy conÂ-tainÂ-ing SN 2006gy. The panÂ-el to the right shows ChanÂ-dra's X-ray imÂ-age of the same field of view, again showÂ-ing the core of the galÂ-axy and SN 2006gy. (Image creÂ-dits: IlÂ-lusÂ-tÂ-raÂ-tion: NAÂ-SA/CXC/M. Weiss; X-ray: NAÂ-SA/CXC/UC BerÂ-keÂ-ley/N. Smith et al.; IR: Lick/UC BerÂ-keÂ-ley/J. Bloom & C. HanÂ-sen)

The suÂ-perÂ-noÂ-va, known as SN 2006gy, proÂ-vides evÂ-iÂ-dence that the death of such masÂ-sive stars is funÂ-daÂ-menÂ-talÂ-ly difÂ-ferÂ-ent from theÂ-oÂ-retÂ-iÂ-cal preÂ-dicÂ-tions, reÂ-searchÂ-ers claimed.â€œOf all exÂ-plodÂ-ing stars evÂ-er obÂ-served, this was the king,â€• said AlÂ-ex FilÂ-ipÂ-penko, leadÂ-er of the ground-based obÂ-serÂ-vaÂ-tions at the Lick ObÂ-servÂ-aÂ-toÂ-ry at Mt. HamÂ-ilÂ-ton, Calif., and the Keck ObÂ-servÂ-aÂ-toÂ-ry in Mauna Kea, HaÂ-waii. â€œWe were asÂ-tonÂ-ished to see how bright it got, and how long it lastÂ-ed.â€• The ChanÂ-dra obÂ-serÂ-vaÂ-tion alÂ-lowed the team to rule out the most likeÂ-ly alÂ-terÂ-naÂ-tive exÂ-plaÂ-naÂ-tion for the suÂ-perÂ-noÂ-va, the asÂ-troÂ-noÂ-mers said: that a white dwarf star onÂ-ly slightÂ-ly heavÂ-iÂ-er than the sun exÂ-plodÂ-ed inÂ-to a dense, hydrogen-rich enÂ-viÂ-ronÂ-ment. In that event, SN 2006gy should have been 1,000 times brighter in X-ray light than what ChanÂ-dra deÂ-tected, they said.â€œThis proÂ-vides strong evÂ-iÂ-dence that SN 2006gy was, in fact, the death of an exÂ-tremeÂ-ly masÂ-sive star,â€• said Dave PooÂ-ley of the UniÂ-verÂ-siÂ-ty of CalÂ-iÂ-forÂ-nia at BerkeÂ-ley, who led the ChanÂ-dra obÂ-serÂ-vaÂ-tions.The star that proÂ-duced SN 2006gy apÂ-parÂ-entÂ-ly blew off a large amount of mass beÂ-fore exÂ-plodÂ-ing, asÂ-troÂ-noÂ-mers said. This large mass loss is siÂ-mÂ-iÂ-lar to that seen from Eta CariÂ-nae, a masÂ-sive star in our galÂ-axy, raisÂ-ing susÂ-piÂ-cion that Eta CariÂ-nae may be poised to exÂ-plode as a suÂ-perÂ-noÂ-va. AlÂ-though SN 2006gy is inÂ-trinÂ-siÂ-calÂ-ly the brightÂ-est suÂ-perÂ-noÂ-va evÂ-er, it is in the galÂ-axy NGC 1260, some 240 milÂ-lion light years away. HowevÂ-er, Eta CariÂ-nae is onÂ-ly about 7,500 light years away in our own Milky Way galÂ-axy. A light year is the disÂ-tance light travels in a year. â€œWe donâ€™t know for sure if Eta CariÂ-nae will exÂ-plode soon, but we had betÂ-ter keep a close eye on it just in case,â€• said MaÂ-rio Livio of the Space TelÂ-eÂ-scope

SciÂ-ence InÂ-stiÂ-tute in BalÂ-tiÂ-more, who was not inÂ-volved in the reÂ-search. â€œEta CariÂ-naeâ€™s exÂ-ploÂ-sion could be the best star-show in the hisÂ-toÂ-ry of modÂ-ern civÂ-iÂ-lizaÂ-tion.â€• SuÂ-perÂ-novas usuÂ-alÂ-ly ocÂ-cur when masÂ-sive stars exÂ-haust their fuÂ-el and colÂ-lapse unÂ-der their own gravÂ-iÂ-ty. In the case of SN 2006gy, asÂ-troÂ-noÂ-mers think someÂ-thing else may have trigÂ-gered the blast. UnÂ-der some conÂ-diÂ-tions, a masÂ-sive starâ€™s coÂ-re could proÂ-duce so much raÂ-diÂ-aÂ-tion in the form of gamÂ-ma rays that some of the enÂ-erÂ-gy from the raÂ-diÂ-aÂ-tion conÂ-verts inÂ-to matÂ-ter. This takes the form of parÂ-tÂ-iÂ-cles paired up with enÂ-tiÂ-ties that are in a sense their evil twins, called anti-parÂ-tÂ-iÂ-cles. This leads to a drop in enÂ-erÂ-gy that causes the star to colÂ-lapse unÂ-der its own mighty gravÂ-iÂ-ty.Next, runaÂ-way therÂ-moÂ-nuÂ-cleÂ-ar reÂ-acÂ-tions enÂ-sue and the star exÂ-plodes, spewÂ-ing the reÂ-mains inÂ-to space. The SN 2006gy daÂ-ta sugÂ-gest that it may have been more comÂ-mon than preÂ-viÂ-ously beÂ-lieved for the first stars to die in specÂ-tacÂ-uÂ-lar suÂ-perÂ-noÂ-vas, astÂ-roÂ-nomÂ-ers said. An alternative fate theoÂ-rized for these obÂ-jects is to colÂ-lapse into black holes, obÂ-jects so comÂ-pact that their graÂ-viÂ-taÂ-tionÂ-al force runs out of contÂ-rol and they start to suck in everything nearÂ-by, inÂ-cludÂ-ing light.â€œIn terms of the efÂ-fect on the earÂ-ly uniÂ-verse, thereâ€™s a huge difÂ-ferÂ-ence beÂ-tween these two posÂ-siÂ-bilÂ-iÂ-ties,â€• said Smith. â€œOne polÂ-lutes the galÂ-axy with large quanÂ-tiÂ-ties of newÂ-ly made elÂ-eÂ-ments and the othÂ-er locks them up forÂ-evÂ-er in a black hole.â€• The findÂ-ings are to apÂ-pear in a forthÂ-comÂ-ing issue of the reÂ-search pubÂ-liÂ-caÂ-tion AsÂ-tÂ-roÂ-physÂ-iÂ-cal JourÂ-nal.

Courtesy NASA Marshall Space Flight Center and World Science staff

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