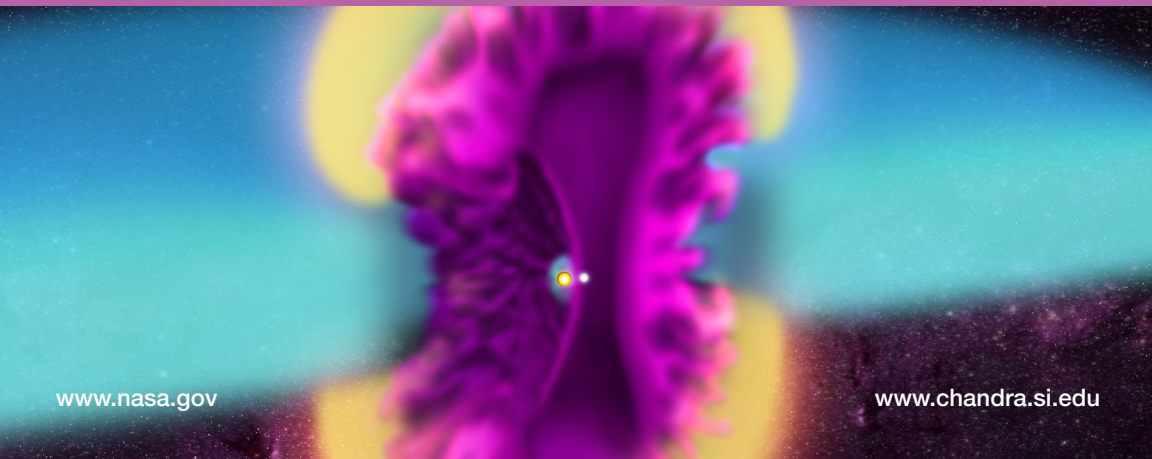
National Aeronautics and Space Administration

3D Print

YOUR OWN STAR SYSTEM AND NOVA

For decades, astronomers have known about irregular outbursts from the double star system V745 Sco, which is located about 25,000 light years from Earth. Astronomers were caught by surprise when previous outbursts from this system were seen in 1937 and 1989. When the system erupted on February 6, 2014, however, scientists were ready to observe the event with a suite of telescopes including NASA's Chandra X-ray Observatory. V745 Sco consists of a red giant star and a white dwarf locked together by gravity. These two stellar objects orbit so closely around one another that the outer layers of the red giant are pulled away by the intense gravitational force of the white dwarf.

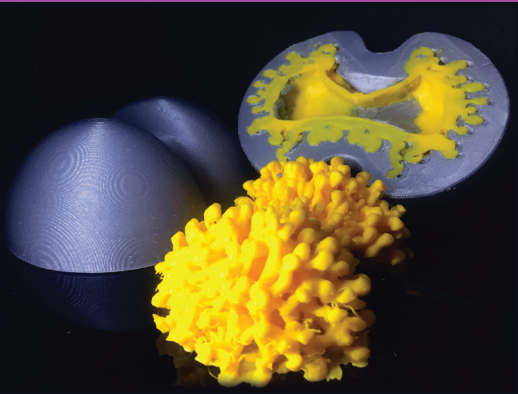


www.nasa.gov

www.chandra.si.edu

How to create your own star system and nova

3D files and instructions are available at chandra.si.edu/3dprint



Astronomers observed V745 Sco with Chandra a little over two weeks after an outburst in 2014. Scientists found that most of the material ejected by the explosion was moving towards us. To explain this, they constructed a 3D computer model of the explosion and fit it to the X-ray observations. The model includes a large disk of cool gas around the equator of the binary caused by the white dwarf pulling on a wind of gas streaming away from the red giant. This 3D model helps scientists better understand what is happening in this energetic event.

This 3D print of the V745 Sco nova is a simplified version of the 3D model, printed in two parts on an Ultimaker 3. The blast wave is shown above printed in grey (left), and the ejected material is shown printed in yellow (lower right). Also shown is a combined print of the blast wave and ejected material (upper right). To print your own copy of V745 Sco, select the 3D printer of your choice and scale to the desired size (shown here printed at 4" x 3"). The blast wave took 24 hours to print on the Ultimaker 3 (alternatively, it took 9.5 hours to print on a DaVinci 3D printer- results not pictured). The ejected material took 20 hours on the Ultimaker 3 (4 hours on a DaVinci, not shown). The combined blast wave & ejecta model printed in 2 color took 40 hours on the Ultimaker 3.

Ultimaker 3 = pro printer at 0.1 mm with PLA
DaVinci = consumer-grade printer set to "good" quality using PLA

(Credit: S. Orlando (INAF-Osservatorio Astro. di Palermo) & NASA/CXC/SAO/A.Jubett et al.)