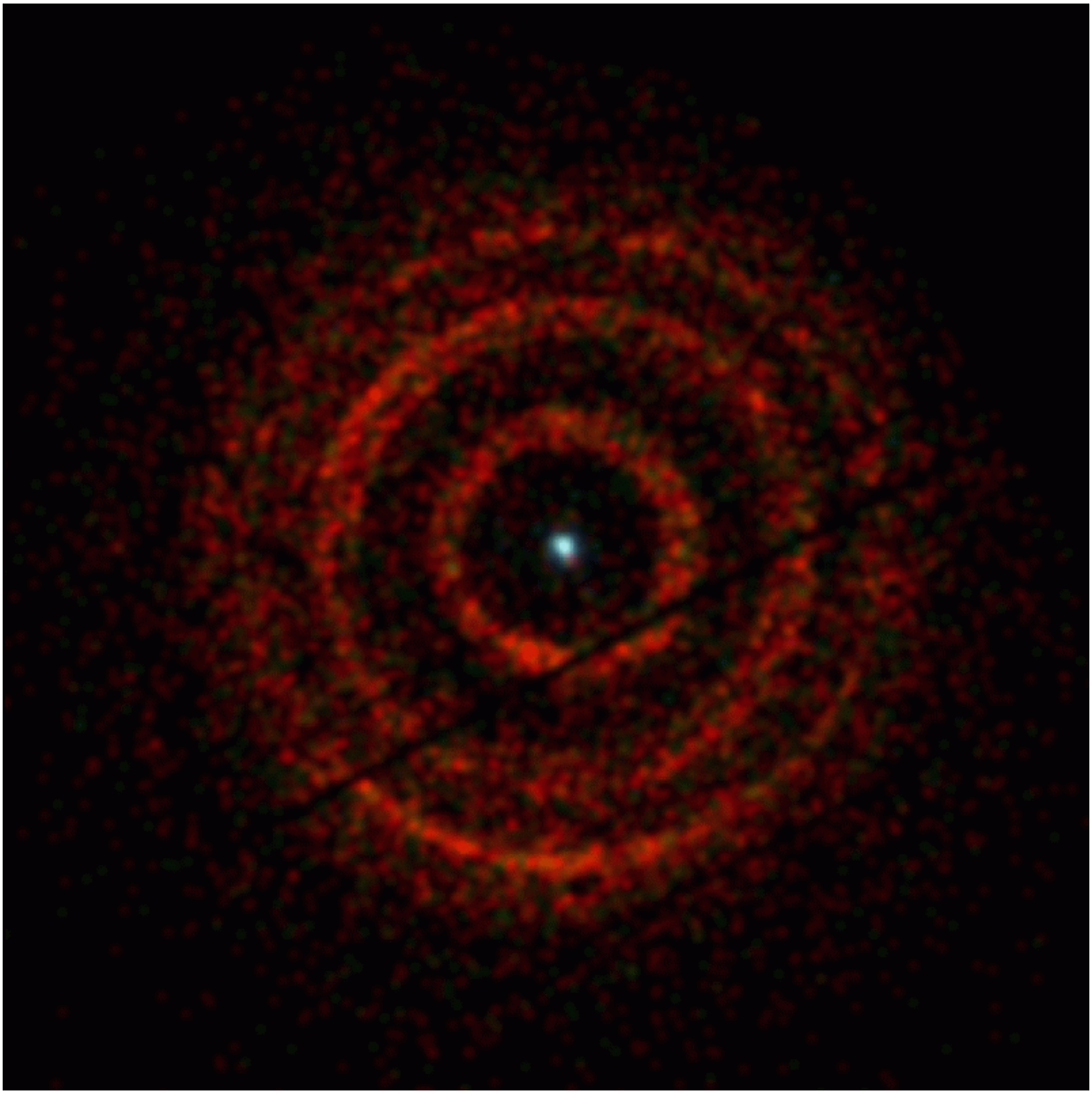
Swift satellite reveals a black hole bull's-eye

July 9 2015, by Francis Reddy



Rings of X-ray light centered on V404 Cygni, a binary system containing an

erupting black hole (dot at center), were imaged by the X-ray Telescope aboard NASA's Swift satellite from June 30 to July 4. A narrow gap splits the middle ring in two. Color indicates the energy of the X-rays, with red representing the lowest (800 to 1,500 electron volts, eV), green for medium (1,500 to 2,500 eV), and the most energetic (2,500 to 5,000 eV) shown in blue. For comparison, visible light has energies ranging from about 2 to 3 eV. The dark lines running diagonally through the image are artifacts of the imaging system. Credit: Andrew Beardmore (Univ. of Leicester) and NASA/Swift

What looks like a shooting target is actually an image of nested rings of X-ray light centered on an erupting black hole. On June 15, NASA's Swift satellite detected the start of a new outburst from V404 Cygni, where a black hole and a sun-like star orbit each other. Since then, astronomers around the world have been monitoring the ongoing light show.

On June 30, a team led by Andrew Beardmore at the University of Leicester, U.K., imaged the system using the X-ray Telescope aboard Swift, revealing a series concentric rings extending about one-third the apparent size of a full moon. A movie made by combining additional observations acquired on July 2 and 4 shows the expansion and gradual fading of the rings.

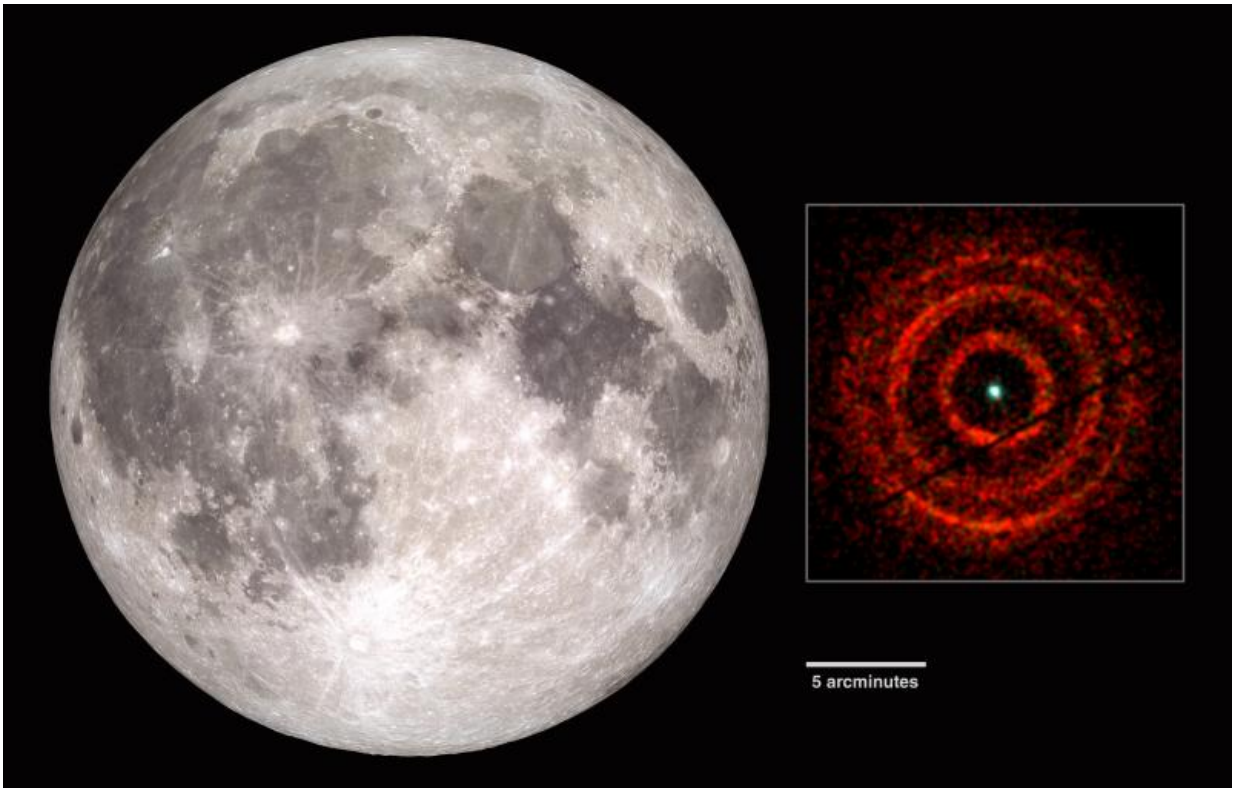
Astronomers say the rings result from an "echo" of X-ray light. The black hole's flares emit X-rays in all directions. Dust layers reflect some of these X-rays back to us, but the light travels a longer distance and reaches us slightly later than light traveling a more direct path. The time delay creates the light echo, forming rings that expand with time.

Detailed analysis of the expanding rings shows that they all originate from a large flare that occurred on June 26 at 1:40 p.m. EDT. There are multiple rings because there are multiple reflecting dust layers between

4,000 and 7,000 light-years away from us. Regular monitoring of the rings and how they change as the eruption continues will allow astronomers to better understand their nature.

"The flexible planning of Swift observations has given us the best dust-scattered X-ray ring images ever seen," Beardmore said. "With these observations we can make a detailed study of the normally invisible interstellar dust in the direction of this black hole."

V404 Cygni is located about 8,000 light-years away. Every couple of decades the black hole fires up in an outburst of high-energy light. Its previous eruption ended in 1989.



The Swift X-ray image of V404 Cygni covers a patch of the sky equal to about half the apparent diameter of the full moon. This image shows the rings as they

appeared on June 30. Credit: NASA's Scientific Visualization Studio (left), Andrew Beardmore (Univ. of Leicester); NASA/Swift (right)

The investigating team includes scientists from the Universities of Leicester, Southampton, and Oxford in the U.K., the University of Alberta in Canada, and the European Space Agency in Spain.

Swift was launched in November 2004 and is managed by NASA's Goddard Space Flight Center in Greenbelt, Maryland. Goddard operates the spacecraft in collaboration with Penn State University in University Park, Pennsylvania, the Los Alamos National Laboratory in New Mexico and Orbital Sciences Corp. in Dulles, Virginia. International collaborators are located in the United Kingdom and Italy. The mission includes contributions from Germany and Japan.

Provided by NASA's Goddard Space Flight Center

Citation: Swift satellite reveals a black hole bull's-eye (2015, July 9) retrieved 20 September 2024 from https://phys.org/news/2015-07-swift-satellite-reveals-black-hole.html