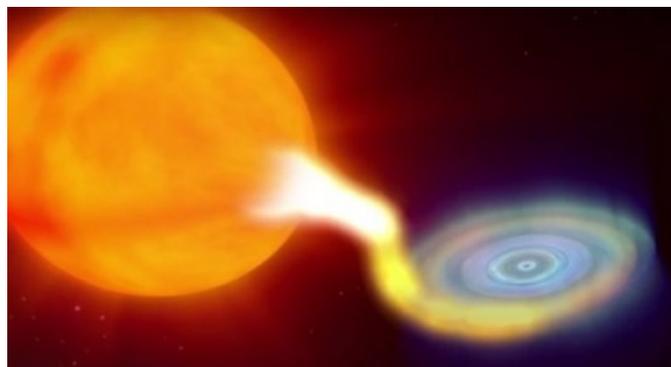


BLACK HOLE MAGNETISM SURPRISINGLY WIMPY

Black holes are famous for their muscle: an intense gravitational pull known to gobble up entire stars and launch streams of matter into space at almost the speed of light. It turns out the reality may not live up to the hype.

In a paper published today in the journal *Science*, University of Florida scientists have discovered these tears in the fabric of the universe have significantly weaker magnetic fields than previously thought.

A 40-mile-wide black hole 8,000 light years from Earth named V404 Cygni yielded the first precise measurements of the magnetic field that surrounds the deepest wells of gravity in the universe. Study authors found the magnetic energy around the black hole is about 400 times lower than previous crude estimates.



An outburst from V404 Cygni.
Credit: NASA's Goddard Space Flight Center

The measurements bring scientists closer to understanding how black holes' magnetism works, deepening our knowledge of how matter behaves under the most extreme conditions -- knowledge that could broaden the limits of nuclear fusion power and GPS systems.

The measurements also will help scientists solve the half-century-old mystery of how "jets" of particles travelling at nearly the speed of light shoot out of black holes' magnetic fields, while everything else is sucked into their abysses, said study co-author **Stephen Eikenberry**, a professor of astronomy in UF's College of Liberal Arts and Sciences:

The question is, how do you do that? Our surprisingly low measurements will force new constraints on theoretical models that previously focussed on strong magnetic fields accelerating and directing the jet flows. We weren't expecting this, so it changes much of what we thought we knew.

Study authors developed the measurements from data collected in 2015 during a black hole's rare outburst of jets. The event was observed through the lens mirror of the 34-foot Gran Telescopio Canarias, the world's largest telescope, co-owned by UF and located in Spain's Canary Islands, with the help of its UF-built infrared camera named CIRCE (Canarias InfraRed Camera Experiment). Smaller jet-producing black holes, like the one observed for the study, are the rock stars of galaxies. Their outbursts occur suddenly and are short-lived, said study lead author **Yigit Dalilar** and co-author **Alan Garner**, doctoral students in UF's astronomy department:

To observe it was something that happens once or twice in one's career. This discovery puts us one step closer to understanding how the universe works.

The 2015 outbursts of V404 Cygni lasted only a couple of weeks. The previous time the same black hole had a similar episode was in 1989.

V404 Cygni is a microquasar and a binary system in the constellation of Cygnus. It contains a black hole with a mass of about $9 M_{\odot}$ and an early K giant star companion with a mass slightly smaller than the Sun. The star and the black hole orbit each other every 6.5 days at fairly close range. Due to their proximity and the intense gravity of the black hole, the companion star loses mass to an accretion disk around the black hole and ultimately to the black hole itself. The "V" in the name indicates that it is a variable star, which repeatedly gets brighter and fainter over time. It is also considered a nova, because at least three times in the 20th century it produced a bright outburst of energy.

DISCOVERY

This system was first noted as Nova Cygni 1938 and given the variable star designation V404 Cygni. It was considered to be an ordinary "moderately fast" nova although large fluctuations were noted during the decline. It was discovered after maximum light, and the photographic magnitude range was measured at 12.5 - 20.5.

On May 22, 1989 the Japanese Ginga Team discovered a new X-ray source that was catalogued as GS 2023+338. This source was quickly linked to V404 Cygni, which was discovered to be in outburst again as Nova Cygni 1989. Follow-up studies showed a previously unnoticed outburst in 1956. There was also a possible brightening in 1979.

AK, with Wikipedia Notes