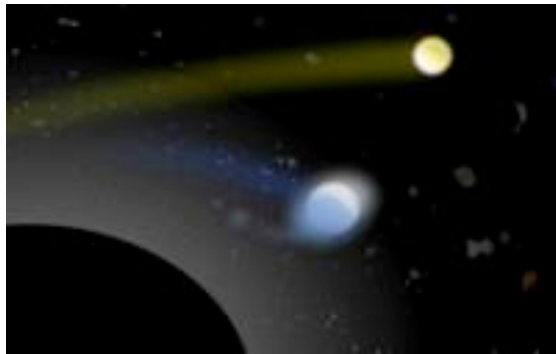


Coupled stars seen as chief diet for hungry black holes

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Courtesy of the University of Utah
and World Science staff

Giant black holes in the centers of galaxies may grow to their enormous sizes by swallowing single stars from pairs of stars that wander too close, a new study proposes.

The study is based on new calculations and previous observations of galaxies including our Milky Way. **"We found black holes grow enormously as a result of sucking in captured binary star partners,"** said University of Utah astrophysicist Ben Bromley, lead author of the work, published April 2 online in the journal *Astrophysical Journal Letters*.



Artist's conception of a supermassive black hole (lower left) with its tremendous gravity capturing one star (bluish, center) from a pair of binary stars, while hurling the second star (yellowish, upper right) away at more than a million miles per hour. The grayish blobs are other stars captured in a cluster near the black hole. They appear distorted because the black hole's gravity curves spacetime and thus bends the starlight. (Credit: Ben Bromley, U. of Utah)

"I believe this has got to be the dominant method for growing supermassive black holes," the giant, hyper-dense objects that sit at the hearts of galaxies, he added. "There are two ways to grow a supermassive black hole: with gas clouds and with stars. Sometimes there's gas and sometimes there is not. We know that from observations of other galaxies. But there are always stars."

Binary stars are pairs of stars that orbit each other.

“Our mechanism is an efficient way to bring a star to a black hole,” Bromley said. “It’s really hard to target a single star at a black hole. It’s a lot easier to throw a binary at it,” just as it’s more difficult to hit a target using a slingshot, which hurls a single stone, than with a bola, which hurls two weights connected by a cord.

Black holes are objects in space so compact that their gravity overwhelms everything nearby and not even light can escape them. Jets of light and energy can flow from a black hole’s vicinity, though, as gas and stars are sucked into it.

Small black holes are believed to result from the collapse of individual stars. But the centers of most galaxies, including our own Milky Way, host “supermassive” black holes that are as heavy as one million to 10 billion Suns put together. Scientists long have debated how supermassive black holes grew during the 14 billion years since the universe began in a great expansion of matter and energy named the Big Bang. One side believes black holes grow larger mainly by sucking in vast amounts of gas; the other side says they grow primarily by capturing and sucking in stars.

A binary star “is essentially a single object much bigger than the size of the individual stars, so it is going to interact with the black hole more efficiently,” Bromley said. “The binary doesn’t have to get nearly as close for one of the stars to get ripped away and captured.”

To prove the theory will require more powerful telescopes to find three key signs, Bromley added. These are: large numbers of small stars captured near supermassive black holes, more observations of stars being “shredded” by gravity from black holes, and large numbers of “hypervelocity stars” that are flung from galaxies at more than a million miles per hour when their binary partners are captured.