

# First Stellar Outcast Speeding at Over 1.5 Million Miles Per Hour

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Using the MMT Observatory in Tucson, AZ, astronomers at the Harvard-Smithsonian Center for Astrophysics (CfA) are the first to report the discovery of a star leaving our galaxy, speeding along at over 1.5 million miles per hour. This incredible speed likely resulted from a close encounter with the Milky Way's central black hole, which flung the star outward like a stone from a slingshot. So strong was the event that the speedy star eventually will be lost altogether, traveling alone in the blackness of intergalactic space.

"We have never before seen a star moving fast enough to completely escape the confines of our galaxy," said co-discoverer Warren Brown (CfA). "We're tempted to call it the outcast star because it was forcefully tossed from its home."

The star, catalogued as SDSS J090745.0+24507, once had a companion star. However, a close pass by the supermassive black hole at the galaxy's center trapped the companion into orbit while the speedster was violently flung out. Astronomer Jack Hills proposed this scenario in 1998, and the discovery of the first expelled star seems to confirm it.

"Only the powerful gravity of a very massive black hole could propel a star with enough force to exit our galaxy," explained Brown.

While the star's speed offers one clue to its origin, its path offers another. By measuring its line-of-sight velocity, it suggests that the star is moving almost directly away from the galactic center. "It's like standing

curbside watching a baseball fly out of the park," said Brown.

Its composition and age provide additional proof of the star's history. The fastest star contains many elements heavier than hydrogen and helium, which astronomers collectively call metals. "Because this is a metal-rich star, we believe that it recently came from a star-forming region like that in the galactic center," said Brown. Less than 80 million years were needed for the star to reach its current location, which is consistent with its estimated age.

The star is traveling twice as fast as galactic escape velocity, meaning that the Milky Way's gravity will not be able to hold onto it. Like a space probe launched from Earth, this star was launched from the galactic center onto a never-ending outward journey. It faces a lonely future as it leaves our galaxy, never to return.

Brown's co-authors on the paper announcing this find are Margaret J. Geller, Scott J. Kenyon and Michael J. Kurtz (Smithsonian Astrophysical Observatory). This study will be published in an upcoming issue of *The Astrophysical Journal*.

Headquartered in Cambridge, Mass., the Harvard-Smithsonian Center for Astrophysics (CfA) is a joint collaboration between the Smithsonian Astrophysical Observatory and the Harvard College Observatory. CfA scientists, organized into six research divisions, study the origin, evolution and ultimate fate of the universe.

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