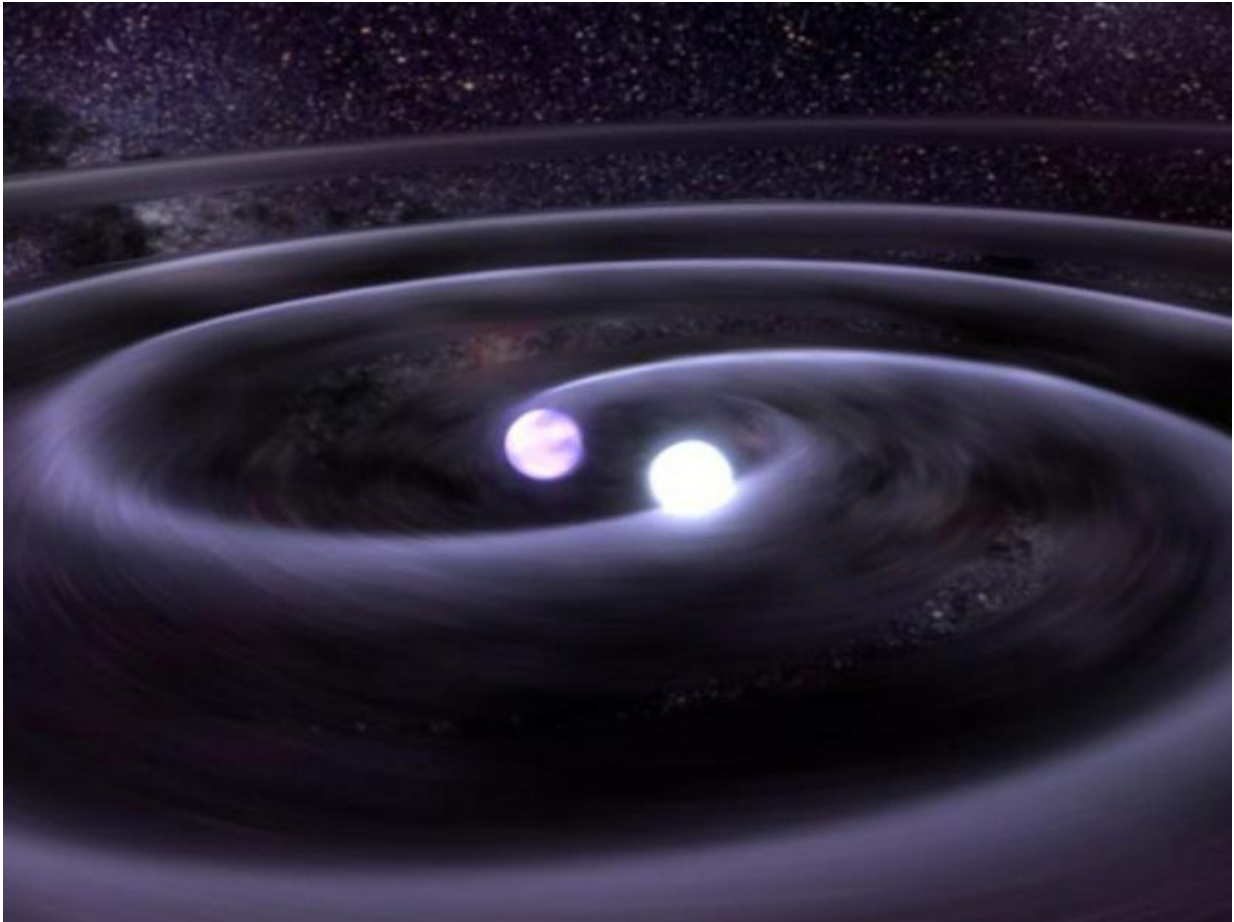


How do stars go rogue?

August 25 2015, by Fraser Cain



Artists impression of a binary star system. Credit: NASA

Rogue stars are moving so quickly they're leaving the Milky Way, and never coming back. How in the universe could this happen?

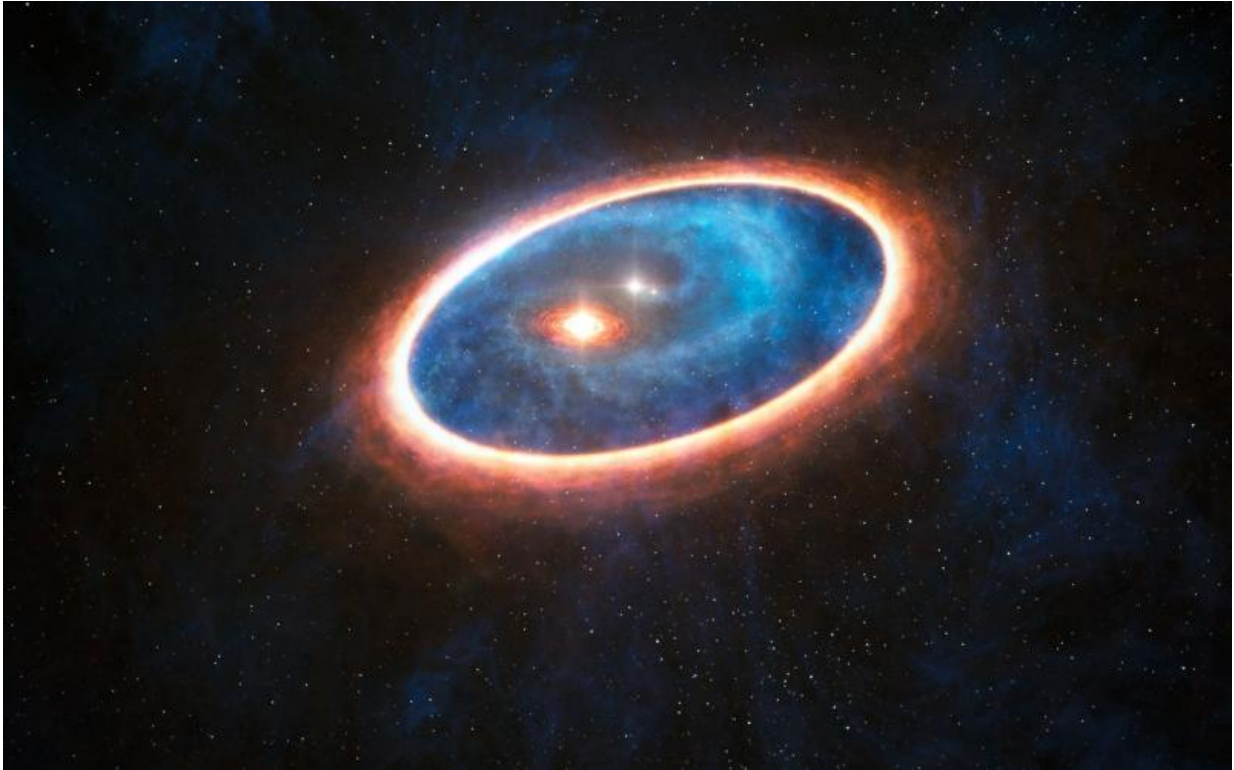
Stars are built with the lightest elements in the [universe](#), hydrogen and helium, but they contain an incomprehensible amount of mass. Our sun is made of 2×10^{30} kgs of stuff. That's a 2 followed by 30 zeros. That's 330,000 times more stuff than the Earth.

You would think it'd be a bit of challenge to throw around something that massive, but there are events in the universe which are so catastrophic, they can kick a star so hard in the pants that it hits galactic escape velocity.

Rogue, or [hypervelocity stars](#) are moving so quickly they're leaving the Milky Way, and never coming back. They've got a one-way ticket to galactic voidsville. The velocity needed depends on the location, you'd need to be traveling close to 500 kilometers per second. That's more than twice the speed the solar system is going as it orbits the centre of the Milky Way.

There are a few ways you can generate enough kick to fire a star right out of the park. They tend to be some of the most extreme events and locations in the universe. Like supernovae, and their big brothers, gamma ray bursts.

Supernovae occur when a massive star runs out of hydrogen, keeps fusing up the periodic table of elements until it reaches iron. Because iron doesn't allow it to generate any energy, the star's gravity collapses it. In a fraction of a second, the star detonates, and anything nearby is incinerated. But what if you happen to be in a binary orbit with a star that suddenly vaporizes in a supernova explosion?



This artist's impression shows the dust and gas around the double star system.
Credit: GG Tauri-A.

That companion star is flung outward with tremendous velocity, like it was fired from a sling, clocking up to 1,200 km/s. That's enough velocity to escape the pull of the Milky Way. Huzzah! Onward, to adventure! Ahh, crap... please do not be pointed at the Earth?

Another way to blast a star out of the Milky Way is by flying it too close to Kevin, the [supermassive black hole](#) at the heart of the galaxy.

And for the bonus round, astronomers recently discovered stars rocketing away from the [galactic core](#) as fast as 900 km/s. It's believed that these travelers were actually part of a binary system. Their partner

was consumed by the Milky Way's supermassive black hole, and the other is whipped out of the galaxy in a gravitational jai halai scoop.

Interestingly, the most common way to get flung out of your galaxy occurs in a galactic collision. Check out this animation of two galaxies banging together. See the spray of stars flung out in long tidal tails? Billions of stars will get ejected when the Milky Way hammers noodle first into Andromeda.

A recent study suggests half the stars in the universe are rogue stars, with no galaxies of their own. Either kicked out of their host galaxy, or possibly formed from a cloud of hydrogen gas, flying out in the void. They are also particularly dangerous to Carol Danvers.

Considering the enormous mass of a star, it's pretty amazing that there are events so catastrophic they can kick entire [stars](#) right out of our own galaxy.

Source: [Universe Today](#)

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