

Could aliens harness stars to keep ahead of expanding universe?

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Dan Hooper, a senior scientist with Fermi National Accelerator Laboratory has written a paper outlining a way future aliens could keep their civilizations alive in spite of the isolation due to an expanding universe. In his paper uploaded to the *arXiv* preprint server, he suggests they might consider collecting and storing stars.



A Dyson sphere is a theoretical structure able to house a star. Originally proposed by Freeman Dyson, the sphere was originally envisioned as a group of satellites completely encompassing a star to capture all of its energy. That energy could then be used for whatever purposes the civilization that created it desired. In this new effort, Hooper suggests aliens might be creating similar structures to provide power once the <u>universe</u> expands to an untenable size.

Prior research has shown that the universe is not just expanding, it is picking up speed as it does so due to dark <u>energy</u>. This means that almost everything in the universe is being flung farther apart from everything else. Such a scenario suggests that <u>galaxies</u> will become increasingly isolated, though the components of the galaxies will remain bound by gravity. So, Hooper wonders, what would an <u>alien</u> race do to ensure it has a steady source of power? He suggests they might be collecting stars at this very moment, getting ready for the days ahead when they will be too far away to grab.

Hooper notes that such a scenario is still very far off—on the order of 100 billion years from now. But he also notes that if aliens were grabbing stars from one galaxy and transporting them back to another, the time for each trip would be on the order of billions of years. Thus, they would have to be doing it now, before they run out of time. He acknowledges that humans would probably not be able to understand the mechanics of moving a star, but muses on the possibility of an alien race powerful enough to do so. He further suggests that if such activity is currently happening, we might be able to see evidence of it by looking for stars that seem to be moving between galaxies—or by looking for holes in galaxies where stars have already been removed.

More information: Life Versus Dark Energy: How An Advanced Civilization Could Resist the Accelerating Expansion of the Universe, arXiv:1806.05203 [astro-ph.CO] <u>arxiv.org/abs/1806.05203</u>



Abstract

The presence of dark energy in our universe is causing space to expand at an accelerating rate. As a result, over the next approximately 100 billion years, all stars residing beyond the Local Group will fall beyond the cosmic horizon and become not only unobservable, but entirely inaccessible, thus limiting how much energy could one day be extracted from them. Here, we consider the likely response of a highly advanced civilization to this situation. In particular, we argue that in order to maximize its access to useable energy, a sufficiently advanced civilization would chose to expand rapidly outward, build Dyson Spheres or similar structures around encountered stars, and use the energy that is harnessed to accelerate those stars away from the approaching horizon and toward the center of the civilization. We find that such efforts will be most effective for stars with masses in the range of $M \sim (0.2-1) M_{\odot}$, and could lead to the harvesting of stars within a region extending out to several tens of Mpc in radius, potentially increasing the total amount of energy that is available to a future civilization by a factor of several thousand. We also discuss the observable signatures of a civilization elsewhere in the universe that is currently in this state of stellar harvesting.

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