

Tracing the family history of stars

And how it can give us insights into galactic history

Looking up into the night sky, the stars we see were once born from massive clouds of molecular hydrogen and other light elements, and almost all of them came into this universe with siblings.

Just like in any human family, a cluster of stellar siblings can be hugely varied. Some stars can be massive and bright, and hundreds of thousands of times the mass of our sun. Some can be tiny and dim, and barely register as light on some of our most sensitive telescopes.

Unlike any human family, at least that this author knows of, the clusters themselves can be populated by hundreds of thousands of stars.

The incredible amounts of mass contained within these clusters causes them to become gravitationally bound to one another. Together, they wander the Milky Way, tragically losing one another as gravitational interactions cause some outer stars to veer off on new trajectories.



Star cluster NGC 6569.

Credit: ESA/Hubble & NASA, R. Cohen

Finding these lost siblings is a task for modern astronomers, where a trace of their history has the potential to reveal insights into the history of our galaxy, and more.

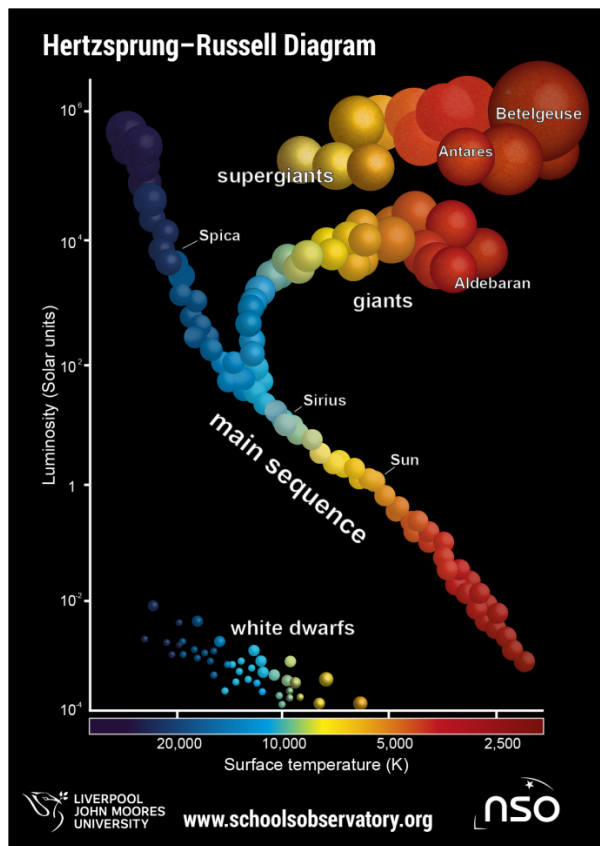
Rewinding the galactic clock

Much like the Earth orbits the sun, the stars in the Milky Way all orbit the center of the galaxy. Unlike our Earth, however, these orbits can take hundreds of millions of years to complete. Our sun, for example, takes around 200 million years to complete a single orbit. Only sharks and crocodiles have been around long enough to see an entire galactic year.

Along the path of a star cluster's orbit, there's plenty of opportunity to encounter obstacles. Other star clusters and massive objects can cause stars from within a cluster to be ripped out and ejected onto new orbits.

These freed stars drift away over time and become hard to distinguish as a member of its parent cluster without careful observation.

If we pay close attention, though, we can tell that a star once belonged to the cluster it was born to. And by doing so, we can start taking guesses as to what ejected it. Some spectacular answers await, like dwarf galaxy collisions and black hole fly-bys, but first we have to trace them back to their parent cluster.



The color and how bright a star is can tell us about where it fits in with stars made of similar stuff.

Establishing the family tree

The light we receive on Earth is the only way we can make informed guesses about these stars and their parent clusters.

Luckily, we've figured out some very clever ways to use as much of the information held within each ray of starlight that we can.

For cluster stars born around the same time and made of the same stuff, they form a very predictable pattern in the way that their temperatures relate with their brightness. This is one way we can help establish clusters from one another, as the clouds they form from will have an impact on the spectrum of light they produce. Still, it's prone to error due to the dustiness of the space between us and the stars that obscures their light as it comes towards us.

Another way that we can tell that stars are related to one another is through the way they move through the galaxy. Even stars ejected onto completely new orbits will share a hint of the same motion of the parent cluster that it came from.

Putting the pieces together

Combining all of the information available in the light we receive helps astronomers make a better guess at whether or not a star belongs to a cluster. From there, they can take a look at what other events are known from galactic history.

As it turns out, stars get ejected for all sorts of reasons.

Medium-sized black holes can pass by or even through a cluster, causing irreparable damage to the cluster's original structure. Clusters can pass through other clusters, too, forever intermingling their sibling members among each parent cluster. Sometimes, the chaos can come from within, where sibling stars can go supernova and create shock waves so powerful that stars on the edge of the cluster get pushed out.

The life of a star cluster is not an easy one.

But for astronomers here on Earth, we can only be thankful for their misfortune as it opens a window into the history of our galaxy.