Episode 3: **Ticking Star Bomb**
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Travis: Welcome to show number four of slacker astronomy; a podcast about astronomy and just about anything else that floats over our heads.

Pamela: What happened to show number 3?

Travis: (sounds of whispering-pspspphphsppshpsh)

Pamela: (simultaneous) Oh! Wow. Really? We did that? Nice! Amazing! I feel sorry for any poor schmoe who missed it.

Travis: I feel sorry for anyone who heard it.

Pamela: Every week or so we will bring you a summary of a recent news event from the world of astronomy. And during slow news weeks, we'll just babble incessantly with friends from other astro blogs...

Aaron: Hi Phil! Talk to you soon!

Travis: This week we're going to talk to you about a ticking time bomb located 10,000 light years away in the southern constellation Ara, the Alter.

Pamela: As in alternative universe?

Travis: No, as in sacrificial alter.

Pamela: Awwww, I was hoping we'd all have to wear goattees.

Travis: <sigh>. The things we must sacrifice for this show...

Pamela: Hidden behind a thick interstellar cloud of gas and dust lurks the densest known star cluster. This system, named Westerlund 1 after its discoverer, Swedish astronomer Bengt Westerlund, contains many of the largest and brightest stars in the galaxy. 40 million years from now it is estimated that roughly 1,500 or more of these stars will explode as supernovae!

Travis: Although these supernovae will be obscured by intervening material, their light will still shine brightly in our skies, glowing brightly with the light of a million billion nuclear explosions.

Pamela: And as much as we may wish to stop these nuclear explosions, there is nothing we can do. Supernovae are nothing more than stars being stars.

[Mamma don't allow no … 0:18-0:35]

Travis: Stars form when large clouds of gas and dust collapse. These clouds aren't large smooth expanses of material, but instead they are lumpy and bumpy like my grandma's home made gravy. This uneven distribution forms an uneven population of stars with a variety of sizes.

Pamela: Stars of different sizes don't form in equal numbers. Unlike in our American population, fat stars are rare in cluster populations. While there are two overweight American's for every 1 skinny person, in clusters there are 100 mediocre, solar massed stars for every 1 massive star. It's like a posse of regular stars huddled around the superstar.

Travis: These massive stars, which are at least 10 times as massive as the Sun, are what first caught Bengt Westerlund's attention in 1961 when he was tired of doing the things Swede's normally do such as count snowflakes and write pop songs. The cloud of material in front of the cluster dims the cluster's light by a factor of 100,000, and these bright stars were the only things he could see.

Pamela: In 2001, astronomers found more than a dozen Wolf-Rayet stars in Westerlund 1. These stars are 20 or more times the mass of the Sun and are experiencing extreme mass loss. Wolf-Rayet Stars are very rare – only 1 in 10 million stars in the galaxy are Wolf-Rayet stars! When astronomers found so many Wolf-Rayets in one location they knew they had found something potentially interesting.

Travis: And that they'd found something potentially explosive!

Pamela: Wolf-Rayet and other very massive stars are very short lived. live fast, die young. And when they die, they explode as Supernovae. It is these massive stars that will light up our skies as supernovae 40 million years from now.

Travis: You're pretty good at predicting the future way out hence. How about something a little more close to home like tonight's lotto numbers?

Pamela: I can't do that. I'm ann astronomer, I'm morally bound by professional ethics to avoid anything even remotely practical.

Travis: Or remotely funny. (waa waaa). In the past four years, astronomers working on three different telescopes at the European Southern Observatory have been able to identify roughly 200 stars in Westerland 1. These stars are just the tip of the stellar pyramid! Astronomers estimate that this cluster contains roughly half a million stars!

Pamela: Up until the discovery of Westerlund 1, super star clusters this size had only been seen in distant galaxies undergoing massive, large-scale star formation. Simon Cowell would be jealous.

Travis: Being able to see one of these clusters up close is exciting because astronomers believe the elder globular clusters that orbit the outskirts of the Milky Way may be the dieing remnants of super star clusters that formed more than 12 billion years ago. With Westerlund 1, we get a chance to see what these galactic senior citizens may have looked like in their youth like a picture of Dorian Gray.

Pamela: Not only does the Westerlund 1 have a lot stars, but it also has a lot of stars packed very close together. the region is just 6 light years across! This means distances about the size of our little solar system typically separate the stars.

Travis: If you thought it was hard to sleep with a streetlight shinning in your window, imagine trying to sleep with a star 20 times more massive than the Sun shining in your window!

Pamela: Crowding all these stars together has some pretty serious consequences.

Travis: When stars get packed too close together, they sometimes collide. And when they collide, they don't exactly bounce around like billiard balls.

Pamela: Colliding stars can stick together to form strange objects such as black holes.

Travis: And if enough stars crash together and stick together the resulting black hole can get pretty big!

Pamela: Black Holes generally get lumped into two very broad categories: stellar mass black holes that are only a few to maybe a few 10s of solar masses, and supermassive black holes that can be millions and billions of solar masses.

Travis: The stellar mass black holes are generally found wandering space with a companion who lights their surroundings, feeds them, and shows them off. Again, an astronomical posse. Stellar mass black holes may exist in isolation, but using our combined slacker astro brain, we can't think of one that's been found.

Pamela: Except the one in aaron's heart.

Travis: So they finally figured out what that was.. that leaves only 7 wonders of the world.

Pamela: Supermassive black holes hold court in the centers of galaxies. These occasionally violent galactic monarchs have masses that seem to be related to the physical characteristics of the spheroid of the galaxy they rule over. This means larger galaxies typically have larger central black holes than smaller galaxies.

Travis: The Westerlund 1 super star cluster isn't exactly a galaxy, but it is much denser than a typical blob of the Milky Way.

Pamela: This means that while colliding stars in Westerlund 1 may never team up to form a supermassive black hole, it is possible that they will glob together to form a third type of black hole – an intermediate mass black hole.

Travis: You said there were only 2 types?!

Pamela: Uh...

Travis: You lied! You lied!

Pamela: There are exceptions to every rule.

Travis: Such as the truth?

Pamela: YOU CANT HANDLE THE TRUTH

(long pause - breathing?)

Aaron: Ummmmmm.. hmnmm. Travis, come here for a second… We'll be right back Pamela. You may want to try a lozenge. Or a shot of whiskey. Or a lozenge in a shot of whiskey.

Aaron : <quiet> Travis,

Travis: Yes, Supreme Overlord?

Aaron: Do not mess with PhDs, for they are powerful and quick to anger.

Travis: Understood

Aaron: Understood, what?

Travis: Understood, my lord.

Aaron: Good, now back to the show.

Pamela: As I was saying, lacking in the interesting name department, intermediate mass black holes are the elusive missing link in supermassive black hole formation. Weighing in at 100 or more solar masses, these middle-sized beasts have eluded astronomers until very recently.

Travis: On March 22 of this year, astronomers using the Chandra X-Ray Observatory announced they had found a 10,000 solar mass black hole in the messier galaxy M74 in Pisces.

Pamela: Where that intermediate mass black hole sits in M74, a super star cluster may once have brightly formed stars.

Travis: And where Westerlund 1 sits now, there may one day be an intermediate mass black hole. It may already be forming as we podcast to you today.

Pamela: In addition to being high mass, high density, black hole forming and explosive, this cluster may also prevent the formation of planets. Astronomers are still trying to figure out the maximum density that a cluster can have and still form planets. With average star separations being roughly the extent of our solar system, it's hard to imagin planets being able to happily gravitational bond to a stellar parent.

Travis: But imagine if they could – You'd go out side and the sky would littered with stars as bright and brighter than the full moon. The dark of night would simply be a fantasy and light pollution would no longer be a problem with a terrestrial origin! – That's PhD talk for – light pollution from lights would be moot.

Pamela: You're making fun of me, but you're making me, and the faint fuzzies I look at, real glad we live here and not there!

Travis: It does make the rest of the galaxy a lot easier to look at.

Pamela: And the rest of the galaxy, and in fact the rest of space, are all potential subjects for future podcasts, but for now, I think it's time to wrap up this podcast.

Travis: We'd like to announce that we have launched a 2nd podcast feed called SA-B. It is a second feed of slacker astronomy where we will place all of our non-news shows. Right now the first Phantom Astronomer show is there and soon Pamela will have the first of our series of Monolithic Monologues. We will also put sound seeing tours there, interviews and much else that we have planned. Subscribe via our site at slackerastronomy.org. It is yet one more reason to destroy your iPod.

Pamela: For Travis and Aaron, this is Pamela Gay. You have been listening to slacker astronomy, a podcast for us, for you, for the voices in our heads.