Hi this is Steve Nerlich from Cheap Astronomy www.cheapastro.com and this is *Your stellar neighbourhood.*

Some fairly well known stars like Sirius, Alpha Centauri, Fomalhaut, Procyon and Altair – and of course the Sun – all share a little pocket of space within the Milky Way – which is variously called the local interstellar cloud, or the Local Fluff.

This arrangement is only temporary. It's thought that the Sun, with its solar system in tow, entered the Local Fluff less than 150,000 years ago and will probably leave it in another 20,000 years. Our Sun is on its regular 226 million year orbit of the Milky Way – and although most stuff around us is doing much the same thing we don't all move at the same speed.

If you ever see Altair and Alpha Centauri in the sky at the same time – face Altair with Alpha Centauri on your right and you'll be roughly looking in the direction we are moving around the Milky Way's centre.

For what it's worth, the Local Fluff has a temperature of 6000 degrees centigrade, but since we are talking about a cloud with a density of 0.1 atoms per cubic centimetre, this almost irrelevant since you'd freeze to death long before the cloud was able conduct a significant amount of heat from its very rarified atoms to yours.

Nonetheless, the Local Fluff is actually an area of relatively high density within the larger Local Bubble. The Local Bubble has a really, really low density of 0.05 atoms per cubic centimetre. The Local Bubble is more than 300 light years across – and is probably the result of a supernova blast since its very tenuous contents is mainly ionised hydrogen which radiates x-rays at a temperature of around a million degrees centigrade. But again, discard your spacesuit and step outside your spacecraft into the Local Bubble and you'll still freeze to death long before those very scarce 1 million degree radiating atoms have any significant effect on you.

It is speculated that a pulsar called Geminga which is about 500 light years away in Gemini may be the neutron star remnant of the supernova that exploded outwards to form the Local Bubble about 300,000 years ago.

The Local Bubble plays host to some open star clusters, including the Pleiades, the Hyades and what's sometimes called the Sirius supercluster – which is composed of Sirius and some lesser known stars out in that direction.

Now, stressing that these are the agreed technical names to use, it's thought that the higher density Local Fluff formed at the conjunction of the Local Bubble and an adjacent Loop 1 Bubble (called so, because there are also Loop 2 and Loop 3 Bubbles nearby). The Loop 1 Bubble includes the well known star Antares – which is roughly 600 light years away from the Sun and appears in the late evening skies around July each year. And one the other side of the Local Bubble is Betelgeuse, which appears in the late evening night skies around February each year – and is roughly 600 light years away and in roughly the opposite direction from Antares.

The next step out is to look at our stellar neighbourhood as a small part of the Orion Arm of the Milky Way – sometimes also referred to as the Orion Spur – since its not one of the major arms of the galaxy – that spiral all the way out from the central bulge to the outer edge. The Orion Spur is it's just an odd swirly extra bit – like, you know, a spur.

Within the Orion Spur are lots of familiar stellar neighbours. There's Polaris at 430 light years from the Sun. And of course, most of the bright stars in the constellation of Orion – hence the name – including Rigel about 800 light years away and the fabulous Orion nebula, the closest stellar nursery to the Sun, at just over 1,300 light years away.

Now, the Orion Spur is situated between the Perseus Arm of the Milky Way – which is further out from the centre – and the Sagittarius arm, which is closer in.

You are probably aware that the Milky Way is not only a spiral galaxy, but a barred spiral galaxy. The bar seems to arise from some sort of orbital resonance and the bar is actually a a channel of hot gas funnelling in from the galaxy's spiral arms towards the galaxy's central bulge.

From each end of the Milky Way's bar, two of the galaxy's biggest spiral arms extend outwards – being the Sagittarius Arm and the Cygnus Arm. From our point of view, the Sagittarius Arm is in the Sagittarius constellation and you are really looking through that arm when you look towards the centre of the galaxy, which is also in Sagittarius. Some well known objects in the Sagittarius arm include the Eagle and the Trifid nebulas, as well as the Carina nebula with its giant unstable 'it could blow anytime' star Eta Carina, which is about 8,000 light years away.

Not until 1951, were astronomers sure that the Milky Way was a spiral galaxy. American astronomer William Morgan is credited with determining that a string of O and B type stars in the constellations of Perseus, Cassiopeia, and Cepheus were all at about the same distance from us.

He was able to demonstrate that they were all in a dense band of stars 5,000 – 8,000 light yeas away, which subsequently became known as the Perseus Arm. Being the outermost main spiral arm, the Perseus Arm was much easier to isolate as there are fewer brighter stars and complex nebulas behind it.

And then, following the same technique, Morgan was also able to identify the Orion and the Sagittarius arms. Since then, the 3d structure of the Milky Way has been further teased out through radio and infra-red astronomy allowing us to explore structures around the galactic centre which is too bright in visible light wavelengths to distinguish much detail. And with space telescopes, like Spitzer, we've also started seeing through some of the dense dust clouds of the galaxy in infra-red.

The most interesting object at the galactic centre – remembering the centre is in the Sagittarius constellation – and you have to look through the Sagittarius Arm to see it – is the Sagittarius A*. You're supposed to say A-star, but really it's spelt A asterix – because it's not exactly a star and you can't see it anyway. It's a very powerful and compact radio source.

Sagittarius A* is thought to be the location of a supermassive black hole at the centre of our Milky Way galaxy – although the compact radio source is off to the side of the centre of mass and may be coming from the black hole's accretion disk. The black hole itself is thought to be over 40 million solar masses with a diameter of 44 million kilometres – which is just a bit smaller than the diameter of Mercury's orbit around the Sun.

So next time someone asks you if there are any black holes nearby – you can say well, I don't know about nearby – but there's a big one just there (pointing to Sagittarius) about 25,000 light years away – and we are kind of in orbit around it.

And by following that orbit, in a mere one million years from now – we'll be well out of the Local Fluff and probably the Local Bubble – and the night sky will look very different from how it looks today. Then, in a hundred million years we'll be getting around the other side of the Milky Way, not only giving us a look at a new part of the Milky Way, but also a whole chunk of the universe, which is currently hidden by the Milky Way's centre. Can't wait.

Thanks for listening. This is Steve Nerlich from Cheap Astronomy, www.cheapastro.com. Cheap Astronomy offers an educational website where talk is cheap and so are the podcasts. No ads, no profit, just good science. Bye.