



THE WORLD

CHAPTER 2

The universe is an incredibly dangerous place.

If you wanted to see what the solar system looks like from the planet Uranus you couldn't for three very good reasons. The first is that Uranus atmosphere is not transparent as ours is. It is so thick that you wouldn't be able to even see the sun let alone any of the other planets or stars. The second reason is that Uranus like many other planets is really just a ball of gas, there is nowhere to stand. There is nothing to stand on to be able to look up. And third reason is that you would be dead. The atmosphere is poisonous. My point is that away from our planet earth the universe seems set of rejecting or destroying life.

People talk of there being many worlds and therefore many chances of there being life on one or more of these other worlds. There certainly are many other worlds orbiting many other suns or stars. But there are a few things worth remembering.

We are part of a universe. That universe, for better or worse, is governed by laws; lots of them. And what applies here on planet Earth applies throughout the universe.

Here's a few examples.

All life requires liquid water. If a planet is too close to its star the water will evaporate away, if too far then it will freeze solid as it has on Mars, for example. So for life to be on any planet it must be in the Goldilocks zone, not too hot and not too cold.

Life requires other life to survive. Life on earth requires plant life and plant life requires photosynthesis. Photosynthesis requires light, especially in the yellow green part of the spectrum. This requires two things, an atmosphere that allows yellow green light through to the foliage and a star that produces a large amount of yellow green light. And that means a G2 main sequence star, preferably a dwarf version as that is far more stable.

Immediately we have eliminated 90% of stars as they are the wrong type. So our search for an earth like planet capable of supporting life has been dramatically altered from a near certainty to a far more remote possibility. It will have to be around a star like our sun, it will have a transparent atmosphere and it will be in the Goldilocks zone.

Even with all that it still could not support life unless the planet had a strong magnetic core. Even a G2 main sequence star, one that is far less volatile than a Blue Giant for example, produces enough harmful radiation to nuke any life form in a few seconds. Earth's powerful magnetic core creates a radiation barrier that not only protects life against the most harmful radiation but allows the useful radiation, sunlight, through to the earth's surface where it can be useful to plants and other life.

If a planet wanted to produce and protect life then its star's location would be important. If it were near the centre of a galaxy or even in one of the arms the radiation levels from all the other nearby stars would make life an impossibility. The best location for a planet wanting to produce life and looking for home, just as we would look for a good piece of real estate would be in the goldilocks zone of a G2 Main Sequence dwarf just outside a galactic arm. And that is exactly where planet Earth is.

It would also be important for that planet to look for a star with several large gas planets circling beyond the Goldilocks zone. These would be excellent protectors against space debris and wandering rock and gas. Their position would, and in our case does, save the life planet from many space collisions.

The planet itself would have to be of the right mass. If it were not it could fall into synchronous orbit where the same side always faces the sun. This would produce scorching heat on one side of the planet and utter cold on the other. Death either way. If our earth were much smaller then its ability to provide a strong enough magnetic barrier would be weakened allowing radiation to strip away our atmosphere. Life could not exist.

A nitrogen and oxygen atmosphere is essential for complex life, and that is what the earth has. An atmosphere such as that on Jupiter does not and cannot produce life. With 1% carbon dioxide added to the nitrogen

and oxygen our atmosphere helps protect us from harmful radiation, allows sunlight in and helps earth have a temperate climate. It allows water evaporation, the formation of clouds and rain and snow to move over the earth's surface.

Water has an incredible capacity to absorb heat and then slowly release it. With two thirds of our planet covered in water we have a situation where the heat from the sun in the day is cooled by the high absorption levels of our oceans and seas. Then, during what should be freezing cold nights the seas release the heat steadily. This produces a stabilised climate for life. A reasonably large area of water to help create a temperate climate seems necessary for life, especially complex life like animals, birds, fish.

For the size of our planet we have an incredibly and most unusually large moon. One of its effects is to cause tidal movements in our oceans moving all sorts of chemicals around the world. It also helps stabilise our axis allowing the seasons as we make our annual pilgrimage around the sun.

In an incredibly dangerous environment our planet Earth is an amazingly complex and interwoven environment just right for life. And not just right for life, but right for intelligent life.

Had our planet been closer to an arm of a galaxy or even in the galaxy itself we would not have a dark night sky and be able to study the stars. In fact we would probably have no chance of recognising that we are part of a galaxy and no chance at all of seeing that the universe has other galaxies. To put it more clearly it seems that our planet is not only the best place for life but also the best place for intelligent life to observe and make discoveries about the universe.

Once again it appears that we have won the cosmic lottery but now there is an added dimension. The world and its interconnected and interacting environment seems designed for life.

The odds of a lucky expansion of a singularity producing a set of laws necessary for the formation of atoms, molecules, solar systems and galax-

ies by pure chance is remote enough, but to have also produced a planet of such a type and in such a place that life can survive is unbelievable.

But lets take our chance theory one step further forward, moving from the big picture of the universe and our world to the small.

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