

Welcome on Planet Earth ...?

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Let's just assume that they really exist, the ETIs or civilisations of extraterrestrial intelligence, that they are somewhere out there in our galaxy. What are the chances that we would actually be able to meet them here on the Earth, to see them face to face? I think that we would all like to experience such an exiting moment. But, if they were really here, what would be the reason for it? Could we really assume that they came here with peaceful intentions? Would they just be curious, and want to have a look, then disappear again, or would there be reasons to think it might be better for mankind if they never turned up on the Earth? We want to know it, we don't just want speculations. Now, so let's have a closer look at the reasons and circumstances of such a visit.

We are optimistic. Let's just assume that there were many ETIs in our galaxy. Well, let's say a million. After a bit of calculations, you come to the result that the next ETI would be about 130 light years away from us. Well, that may sound like: 130 kilometres on foot – quite a lot, but possible. But it is indeed an immense distance. If I flew this distance at the speed of a shuttle with 28,000 km/h, it would take me exactly five million years! Of course ETIs would probably be far more advanced from a technical point of view, and thus much faster. Just assume they were THE ultimate ETI, and they had a technology which would make everything possible which is physically allowed. And let's also assume they were biological beings, and they lived on a planet similar to the Earth. In that case, for them just as for us, a propulsion of 1g would be exactly the right acceleration for travelling. So the first half of the distance they would accelerate with 1g, and the second half they would use again 1g to accelerate back to zero.

How long would such a journey be for ETIs under the very best of circumstances? The theory of relativity gives us the answer: Calculated in the time of the Earth it would be 132 years. But they would achieve 99.99% light speed in the middle of their journey, and for them the journey would only be 9.5 years. The time of the astronaut during a spaceflight, and according to Einstein especially with very fast ones, is always shorter than the time of other people. And that's also true for shuttle flights. So it is proven that during my mission in 1993 I remained 254 microseconds younger than every other inhabitant of the Earth. It's not much, but still. So, if you fly faster, just like our ETIs, it keeps you younger! But physics demands a very high price for this convenience: huge amounts of fuel, even if it is a matter/antimatter fuel, the best means of propulsion available. As I said, we will not discuss whether we will ever have such a technology, which could use matter/antimatter for propulsion, physics anyway does not contradict. The amount of matter/antimatter which is required depends a lot on the so-called payload, i.e. the part of the spaceship, which is not fuel.

We want to estimate the size of the payload of such an interstellar spaceship. A shuttle is designed for two weeks, so it is not very spacious. And if you want to send six astronauts on a ten-year journey instead of a two-week journey, the spaceship should have enough space, let's say ten times more, and that also means that it would be heavier than the shuttle, in total about 2,000 tons plus the super-duper matter/antimatter propulsion, let's say another 2,000 tons. So altogether that would be a payload of 4,000 tons. And this is rather underestimated, but we said we wanted to use the most favourable conditions.

Now, what would be the fuel demand for that payload under the given travel conditions? Relativistic rocket equations demand at least 20,000 times more than the payload, that would be at least 100 million tons. In reality, we should definitely take far more, about one billion tons. Altogether, we can say the spaceship the ETIs would board, would have a size of 0.1 cubic kilometres. Let's imagine the spaceship just like the old UFOs like a disc with a thickness of 100 metres, then the spaceship would have a diameter of a bit more than one kilometre – a real monster.

The ETI astronauts would just make it to the Earth with this spaceship ... but they would never make it back to their planet. If they wanted to go back, they would need to have more fuel right in the beginning. And they would need a lot more. To be more precise, they would need at least 20,000 times more. So they would start with their spaceship disc, which would then with the same thickness have a diameter of 160 kilometres, half filled with antimatter, and the other with normal matter, and in the centre of the disc they would have the true core and living area of the spaceship. During their flight they would blow-off the outer parts of the disc, which would serve as fuel tanks, after they are used up, so that they would turn up on the Earth with a spaceship with a diameter of one kilometre, which would also take them back to their home planet.

So, these are the not very encouraging facts. You might object that the high fuel demand occurs only because of the very relativistic travel speed. And that is true. If the spaceship were designed in a way that it could only achieve a maximum speed of 60% light speed, it would only need 4,000 tons of matter/antimatter, that is just the same as the payload as such. But then the journey would not only take 9.5 years, but with a correspondingly constant propulsion acceleration of four thousandths g it would take 350 years – and mind that this is only the outward flight.

Whichever way you look at it, it doesn't really sound like ETIs would just want to pay a short visit to have a look at how we live here on the Earth, and then disappear again. No doubt that any ETI civilisation would shrink back from the efforts of such a journey. Is there any sensible being that would embark on a journey of at least 10 years to the unknown planet Earth, with an uncertain outcome? And is there any civilisation that would take the trouble to build propulsions with a thrust of one billion tons (one million times more than the shuttle!), and to produce a very risky fuel with an energy amount that matches the energy consumption of the Earth today for 100 million years. There would simply not be any sensible reason to embark on such a journey.

Really not? Yes, there is one. The astrophysicist Ben Zuckerman showed that many ETI cultures should have a high motivation to leave their home planet: Their star has ceased to exist. He proved in a mathematically simple way that with the assumed one million ETI cultures in our galaxy at least 10,000 would already have been struck by that tragic fate. So it would all be about mere survival. Under these apocalyptic circumstances their goal would certainly not be to send a handful of astronauts to a habitable planet like the Earth, but to send as many as possible. Not only a few thousand, better to send many millions of individuals.

Is it possible to transport millions of biological beings over interstellar distances? That is indeed easier than you may think at the moment. Already during the 1970s a NASA study group showed that this would be possible even with the technology of those times. Many millions of individuals would be able to exist absolutely self-sufficiently for an unlimited period of time. They worked out that each of the space arks would consist of a huge rotating cylinder with a length of 32 km and a diameter of 6.4 km, inside it would offer living space for 10 million individuals with 1g including larger lakes, forests, agriculture, etc. With this diameter the atmosphere would already create a blue sky with layers of clouds at an altitude of 1-2 km, so they would have earth-like weather and ozone as a protection against cosmic radiation. Space arks with these dimensions are on the limit of what makes sense today from an

ecological point of view, but they are still physically feasible. It would be possible to use the materials available today to build space arks with a diameter of up to 19 kilometres and living space for up to 100 million people. Of course these arks would not accelerate to almost light speed. Under these circumstances with a high quality of life it would be sufficient to travel through space »at a leisurely pace« of »only« 60% light speed or even less, and reach the Earth after 350 or more years.

So, that would be the kind of extraterrestrial UFOs we might expect on the sky, far away from what has been sighted as UFOs. Instead of small and nimble saucers ETI UFOs are huge objects with an extension of umpteen kilometres, which because of their mass will only be able to move at a leisurely pace in space and especially near the Earth. In this respect Roland Emmerich's description of extraterrestrial spacecraft in the science fiction film "Independence Day" was quite correct. But certainly not his suggestion that they would be hovering over the Earth at low altitudes. The required propulsions with their many millions of tons of thrust would leave a corridor of destruction of several square kilometres on the Earth's surface. The space arks would rather circle the Earth on a safe orbit of some hundred kilometres, and use smaller payload vehicles to descend to the Earth.

Well, the original question whether these ETIs would come with peaceful intentions, is under these circumstances no longer relevant. The crucial issue for them would be to survive, to look for a new home planet. And humans would just be a nuisance on such an attractive planet as the Earth. If an ETI civilisation takes on the burden of such a long journey into the unknown lasting many generations, and if their goal is to survive and also if they know that they won't be able to land on another planet; if the ETIs are motivated by these reasons and technically far more advanced, and they appear on our planet, this would only mean one thing ... the end of our civilisation.