UFO Book—ET Suspect Material for Website 10/1/24

Conservatively speaking, interstellar travel at around 1% the speed of light will almost certainly become possible. A fusion-powered spaceship that releases hot, high-speed fusion products (mostly helium atoms) for propulsion could carry enough fuel to achieve 1% the speed of light, and then slow down once it neared its destination, perhaps hundreds or thousands of light years away. Interstellar trips that use fusion may require hundreds of thousands or millions of years of travel time. During that time, interstellar dust and cosmic rays that are very high energy protons would cause cumulative damage. A ship would also need to produce at least a minimal amount of power to remain active during the long period that it is coasting through space. If this is the only way to achieve interstellar travel, the chances of sending living things are fairly slim, unless a very good method of suspended animation is developed. While our own robotic probes have traveled in space about 50,000 times farther than humans have ever traveled, a spaceship that can keep humans safe and alive even traveling to the nearest star would be quite a difficult technical feat compared to sending some kind of robot.

This conventional robots-only mode of “slow” travel at perhaps 1% the speed of light is consistent with all the known laws of physics, and can probably be perfected within a relatively short time. But, other hypothetical methods *could* allow biological beings to travel between the stars in a reasonable amount of time, perhaps without even needing to pack a lunch or long-term life support equipment. These methods are more iffy, because they might violate the laws of physics, and they would require such a tremendous amount of energy as to be essentially impossible.

A fusion-powered spaceship could have enough thrust to accelerate at 1g (same as the gravity at the surface of the Earth)[1] for a few days, and reach ~1% the speed of light. When it got close to its destination, it would decelerate at 1g for another few days. In order to reach a point on the other side of the galaxy, say 100,000 light years away, about 10 million years of travel time would be required. However, if there were a propulsion system that could keep accelerating at 1g for *decades*, then the relativistic time dilation for the astronaut inside the ship would become an important factor, and the astronaut would think the trip only took a few decades, whereas in reality, the journey would have taken just over 100,000 years. Specifically, the ship would accelerate for 10.3 years (ship time) and then decelerate for 10.3 years, finally arriving at the point 100,000 light years away. Because of the wonders of special relativity, if the astronaut could tolerate a much higher g-force (the amount of acceleration caused by gravity), the trip would take far less than two decades and would only use a little more fuel. For example, if the acceleration of the spaceship is 100,000 g instead of 1g, the one-way trip would only take a little over 4 hours by the astronaut's reckoning, and would only require slightly more than twice as much fuel as the 1g trip. Nonetheless, if the spaceship then returned to Earth at the same speed, all the astronauts' friends would be long, long dead, whereas the astronaut would have experienced only about eight hours total travel time.

A spaceship operating at 1g of thrust for decades (or 100,000 g for hours) does not violate any natural laws, although we have no idea how to build one. In theory, there is also a

[1] Because human space travelers experience adverse effects from prolonged weightlessness, such as bone loss and muscle atrophy, the spaceship needs to simulate Earth's gravity. This artificial gravity could be implemented either using the engine acceleration or by using a revolving living space (a centrifuge). Earth gravity of 1g is approximately the maximum engine thrust that can be tolerated in the long term by humans. An engine that could provide 1 g of thrust for the entire journey would allow the ship to arrive as soon as possible without harming the astronauts. At 2 g, the ship would arrive sooner, but the astronauts would probably be harmed, and there's no practical way to reduce the number of engine g s experienced by an astronaut, as opposed to the fact that it is relatively easy to *increase* the g s, by using a centrifuge.

way that a living being could tolerate 100,000 g. Simply take a very dense object like a white dwarf star (the mass of the Sun but crunched down to the size of the Earth), which has gravity near the surface of about 100,000 g. Strap rockets to that star which can accelerate the whole star at 100,000 g, let's say, to the right. Then position the spaceship on the left side of the star, about 1000 miles away from the star's surface, while being careful to keep that spacing constant. The spaceship would be continuously pulled to the right toward the star while the star is accelerating to the right, away from the spaceship. Keep adjusting the rocket thrust so that the spaceship is always a thousand miles to the left of the star. Voila! The astronaut will experience very low g-forces while accelerating through space at 100,000 g! Unfortunately, this method would be "astronomically" expensive (pardon the pun). Just imagine the cost of rockets that can hurl the entire mass of a star at 100,000 g! Nonetheless, there are no theoretical barriers in known physics that would absolutely preclude this method.[2]

Courtesy of spacefaring sagas like *Star Trek*, *Stargate*, *Farscape*, *Babylon 5*, and *Dr. Who,* two alternative methods of traveling long distances at near- or-faster-than-light speeds have been introduced into the popular imagination: wormholes and warp drives. A wormhole offers a shortcut between two locations in space or even in time. The other method, a warp drive such as the Alcubierre drive, creates a bubble around a spaceship, in which space in front of the spaceship is contracted and the space behind it is expanded to achieve speeds that are effectively faster-than-light. As with many aspects of sci-fi entertainment, the mechanics and feasibility of wormholes and warp drives in fiction take creative liberties with speculative physics. On the surface, solutions to general relativity say that both of these travel accelerating methods may be

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[2] A star accelerating in this fashion would emit a substantial quantity of gravitational waves, which would significantly disturb space.

possible. However, more in-depth analysis repeatedly shows that some glitch or another challenges the viability of each proposed type of warp or Alcubierre drive. Further undermining their workability is both methods' reliance on negative energy, the existence of which is likely impossible, at least in a form that would be usable. Staggering amounts of regular matter, typically much more than the mass of the observable universe, also may be required. Unfortunately, by playing fast and loose with unproven physics, sci-fi has oversimplified the challenges of long-distance space travel. It has also skewed perceptions of reality and over-exaggerated the likelihood that ETs (if they exist) could reach Earth from other star systems. Not only has sci-fi misrepresented advanced technological civilizations' possible faster-than-light modes of transport, it may have misled us about their dispositions and intentions.