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“The spaceship was ancient, yet the mysterious force of the Great Destroyer chained within the sealed coils between the hulls drove it with unthinkable speed across the star-shot darkness. The interior was close and smoky, for the only light came from oil lamps turned low to slow the fouling of the air... On the lower decks, the horses of the small party of Valkyr warriors aboard stomped the steel deck plates, impatient in their close confinement; while in the tiny bubble of glass at the very prow of the ancient vessel, two shamen of the hereditary caste of Navigators drove the pulsing starship toward a spot beyond the veil...” – Alfred Coppel, “The Rebel of Valkyr” (1950)

C-question: Consider the following question: Assuming that C is constant, how did the point in space where the Earth is currently arrive before light from just after the Big Bang? Or as a Fermilab video on YouTube asks, “If the universe is only 14 billion years old, how can it be 92 billion light years wide?” There must have been a time right after the Big Bang event when the universe was expanding at faster than light speed, and thus, scientist theorize that no matter how powerful our telescopes, we will never be able to see the moment of the Big Bang. We should not be able to see farther back than about 100,000 years after the Big Bang event.

- ✓ “In the olden days of cosmology – that is, before the 1998 discovery that the universe’s expansion is accelerating – there was hope that the universe might bounce back from a ‘Big Crunch.’ In that scenario, the universe’s sheer heft would eventually cause it to stop expanding, switch gears and shift into reverse. Like a film of the Big Bang played backward, all of space would collapse to a single point. Cosmologist Stephen Hawking once speculated that time itself would switch directions during the contraction phase. (Later, after discussions with his assistant Raymond Laflamme, he changed his mind.) Today, with no end in sight for cosmic expansion, the ‘Big Crunch’ is out of fashion. But new theories are offering some hope that the heat death may not be terminal.” – Paul Halpern, “When the End is Just the Beginning: Exploring Cosmic Cycles,” NOVA Newsletter, August 12, 2014.

“Who would once have thought that the crossing of the wide ocean was calmer and safer than of the narrow Adriatic Sea, Baltic Sea, or English Channel? Given ships or sails adapted to the breezes of heaven, there will be those who will not shrink from even that vast expanse.”

– Translated by Edward Rosen (1965), Kepler’s Conversation with Galileo’s Sidereal Messenger (1610), p. 39¹

Breezes of the Heavens: The European ‘advantage’ from the 15th to the 19th Century was not gunpowder, it was sailing ships. It cannot be overstated. With sailing ships and navigation, Europeans could appear anywhere, at nearly any time, on the world’s coastlines on missions of exploration, trade, slavery, colonization or war.

And they could come back again and again, as long as the will to do so existed because the world had no comparable seagoing vessels. Such was the importance of sailing warships, as the most expensive and concentrated unit of military firepower, that the Seven Years War (1756-1763) is referred to by some historians as “World War Zero.”

- ✓ Are WWI and possibly the Seven Years War, ‘world wars’ because they were fought all over the globe by European colonial powers, with minimal contributions from non-European nations and peoples, or was WWII the first ‘true world war’ because it was fought all over the globe, equally by regional and global powers, nations, and peoples from all over the globe? It depends on how the term is defined.

In science-fiction settings, *starships serve the same purpose*, serve as proxies for sailing ships in stories that usually parallel Earth history, especially the Age of Sail and Age of Exploration – from alien invasions of the Earth now, to galactic exploration, colonization, trade, war – invasion of alien planets in the future by humanity – and futuristic far-flung empires.

Starship Jefferson: Starship is a term generically used to indicate a spacecraft capable of interstellar flight, with a minimum speed of half-light speed, and probably at faster than light (FTL).

- ✓ The term “starship” was first used in 1882, according to Merriam-Webster online dictionary, sixteen years before H.G. Well’s War of the Worlds (which didn’t require the Martians to have starship technology) was published. In 1610, Kepler mentioned, “ships or sails adapted to the breezes of heaven” (*ut supra*).

A Starship requires at the minimum, hull capable of withstanding the forces and protecting the crew, computers, flight controls (including stopping and turning), life support, fuel, food and medical supplies, and of course, the all-important stardrive propulsion system.² Starship technology (at least in Hollywood) also tends to assume that some kind of gravitational and anti-inertial technology has been developed (to prevent the crew from being splattered against the bulkheads when the ship takes off at FTL speed), and that that pesky time-dilation problem has been overcome so that the crew doesn’t come back to find everyone on home world is dead centuries gone (it would make storytelling very difficult).

- ✓ “You might have to decide between seeing your children again and the future of the human race.” – Prof. Amelia Brand, *Interstellar* (2014).

Starships, which are often treated in such a blasé, cliché manner on television and in movies – represent the most comprehensive and concentrated form of technology available to the society, much the same as a modern nuclear powered submarine or aircraft carrier. They are marvels of intricate engineering and advanced technology, they represent the combined result of all of the Applications on the current Era Matrix.

- ✓ Conversely, in Harry Turtledove’s 1985 short story, “The Road Not Taken,” FTL – which we always assume is extremely complicated physics – turns out to be absurdly simple such that it could have been discovered by 17th Century technology. The price, however, is that technological advance of a species stops with the discovery; this is not consistent with the mainstream assumptions of GGDM, but is interesting.

They also represent the most concentrated unit of firepower, and the tenuous links that bridge the vast interstellar void, face the unknown, and hold interstellar cultures together. And like modern nuclear ballistic missile submarine commanders, starship captains hold in their hands the frightening power to destroy planets or even an entire interstellar civilization, or to protect it from enemies and aliens, and over which planetary governments have little control.

- ✓ **Shona:** Reindeer can’t fly. They just can’t. **Santa Claus:** No. No, they can’t. It’s a scientific impossibility. That is why I feed mine magic carrots. – Dr. Who, “Last Christmas” (2014).

- Assumptions of Light: GGDM requires that certain assumptions be made that would not be approved by current science. Whether we (or anything) can travel at FTL speeds is not as clearly prohibited as it seemed previously. The game must assume, *for the setting*, that reliable, repeatable FTL travel is possible. FTL is the necessary “Applied Phlebotinum” of GGDM as it is in every other interstellar ‘soft sci-fi’ setting. To wit:

- ✓ “Phlebotinum is the versatile substance that may be rubbed on anything to cause an effect needed by a plot. Examples include but are not limited to: nanotechnology, magic crystal emanations, pixie dust, and Green Rocks. In essence, it is plot fuel. Without it, the story would grind to an abrupt halt. It’s the science that powers the FTL drive on the starship so the characters can get somewhere, it’s the magic that hatches the Egg MacGuffin so the protagonist can save an endangered species, it’s the strange things unknown to science or magic that do basically anything except those limits and dangers required by the plot. The reader does not know how Phlebotinum would work and the creators hope nobody cares. According to Joss Whedon, during the DVD commentary for the pilot episode of *Buffy the Vampire Slayer*, the term ‘phlebotinum’ originates from Buffy writer (and *Angel* co-creator) David Greenwalt’s sudden outburst: ‘Don’t touch the phlebotinum!’ apropos of nothing.” – from TV Tropes.com, “Applied Phlebotinum.”

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Most FTL travel in science-fiction stories assume temporal abrogation or simply ignore the time-dilation effect. However, there are some interesting exceptions here and there. In Arthur C. Clarke’s Childhood’s End, a human stows away on an Overlord ship returning to their homeworld, and returns to Earth 80 years later (our time). All of his friends, everyone he knew is either deceased, or very elderly. Having much of the same practical effect as time dilation, cold sleep or cryogenic hibernation and near light speed travel, insures that passengers and crew age little, while on their return, everyone they knew is old or dead.

- ✓ “Space is big. Really big. You just won’t believe how vastly, hugely, mind-bogglingly big it is. So big, in fact, that if Faster-Than-Light Travel is impossible it would take multiple human lifetimes to reach another star, and one way around this is you hibernate for most of the trip there. This is the Sleeper Starship. A modern variation that is becoming popular is one where the passengers just upload their brains into the ship’s computers and are downloaded into cloned bodies when they reach their destination. An older variant – a cross between a sleeper ship and a generation ship – is the ‘seed ship,’ which carries frozen embryos instead of frozen adults to save weight. The problems involved in rearing a generation of newborns without live parents are left as an exercise for the author.” – TV Tropes.com, “Sleeper Ship.”
 - Arthur C. Clark’s Songs of Distant Earth (1986) featured a ‘seed ship’ with an AI or robotic parent. See also, Wikipedia article, “Embryo space colonization.” Someday the theoretical will need to actualize.

An example of this is shown in the short-lived television series, *Earth 2*, where the young-looking pilot, who is over a century old due to cold sleep, is stranded on a frontier colony 22 light years from Earth and appears to be in mental distress over having to live on a planet and age normally. Due to cold sleep, it is unclear in the series whether they are travelling at FTL speeds. GGDM probably assumes abrogation of time dilation, but it’s not frozen in stone, and participants could experiment with time-dilation effects.

- ✓ Suppose someone invented a hibernation or stasis technology that would allow humans to sleep for decades or centuries. How would you test it? By having a person – probably a terminally ill person, unless that would cause a problem with the test – enter the hibernation unit and sleep. How long does the test need to be, do they need to sleep for decades or centuries to prove the system works? Why only one person?, you’d need a bunch just in case of medical or mechanical failure. Maybe there are people in hibernation sleep now in some deep place, just in case there was a nuclear war (yes, I played the Morrow Project RPG long ago)? Maybe sometime after 2100, a news conference will reveal that a hibernation unit experiment begun in the late 20th Century was successful, the people slept for over a century and woke up, and we can now begin putting all of humanity in hibernation ships. The movie *Magellan* (2017) unveiled stasis technology as part of the human ability to reach Saturn and beyond, but wisely never provided details, except to say that humans are not supposed to be able to dream while in stasis.

“The brave explorers or colonists set out in their spaceship to spread humankind to the stars. You can’t travel faster than light, so they’re going to spend most of the trip on a Sleeper Starship as Human Popsicles, or it’s a Generation Ship and it’ll be their descendants who step out at the other end of the trip. Either way, they’re saying goodbye forever to everyone and everything they know. Decades and centuries pass, and eventually they arrive at their destination – and there’s people there waiting for them.

Turns out, Faster-Than-Light Travel (or at least sublight travel that is vastly faster than theirs) is possible, and it got sorted out while they were in transit. Now the same trip that took them centuries can be done and be back in time for Christmas. And that planet you were all set to colonise? Done already, and actually we’re not sure there’s any room for you... Expect the brave pioneers to be upset about this.”

– TVTropes.com, “Lightspeed Leapfrog”³

Stardrive: In the modern era of television and big-screen space adventure, the momentary screenshot of starships taking off or accelerating, has become the visual signature of every series or movie. Nothing says you are off to escapist adventure more than a ship taking off at a mind-blurring faster-than-light speed, or passing through a bright gate into some other dimension, bound for who knows where (accompanied by loud orchestra music and drama). And increasingly, every new story with serious science-fiction pretensions has had to invent a new, visually interesting way to travel between stars and planets, such that there are now, at least a dozen different ways to take off for adventure at mind-bending (if not particularly safe) speeds burned into the memories of dedicated science-fiction fans. There are now warp drives, hyper-drives, jump gates, jump circuits, FTL drives, slipstream drives, star gates, wave engines, transwarp drives, improbability drives, gravity drives,⁴ planar drive, foldspace, and planespace.

In most programs, the form of interstellar travel is just a visual effect, an afterthought from the special effects department, but in the rarified air of *good science-fiction writing*, the stardrive takes its proper place as a symbol or metaphor of the story and the universe in which it is set.

- ✓ For example, warp drive has become the signature of Star Trek; it probably doesn’t have any greater meaning within the Star Trek universe than simply a visual effect

and a way to get there in a blurry hurry (*ut infra*). However, slipstream travel in Andromeda – that is, travel along cortex-like quantum superstrings underlying the reality of the universe – is portrayed visually like travelling through a brain at microscopic level and may serve as a metaphor for the series (like maybe a trip through Gene Roddenberry’s brain!). Since travel between routes becomes easier the more it is done, making regular routes between colonies easy and fast, slipstream travel also resembles *neuroplasticity* (or brain plasticity); the mode of learning and retention in human brains. Seamus Harper in Andromeda said, “Slipstream is our method of going faster than the speed of light, without going faster than the speed of light.”

- ✓ In the 2016 movie *Interstellar*, the wormhole travel is important to the story, it is the place where the characters connect briefly with creatures in a higher dimension, which echoes the story overall regarding the potential of humanity.

Yet, in each program, in each universe, in each novel, there is usually only *one* efficient form of interstellar travel which is used universally by all starfaring races. In GGDM, this does not have to be true; positions are free to develop their own forms of stardrives (or try to steal others) such that multiple competing Stardrive Patents may play out in the game universe.

- ✓ Extra-dimensional travel is often the mechanism for FTL travel in science-fiction stories. People describe it as folding a piece of paper in half then punching a pen through it (this is probably the origin of the ‘folding space’ idea). But with a modern PC at my disposal, it seems that another explanation would be navigating the universe (like a document) via thumbnail view on the sidebar; you don’t have to scroll through 20 pages, you just pull down the thumbnail bar, click the page, and you are there.
- T-minus 10,000,000: A ‘real world’ theory for a ‘warp drive’ is called the Alcubierre Drive, invented in 1994 by Miguel Alcubierre, 30 years after the term was popularized in the original *Star Trek* television series.
 - ✓ “The *Star Trek* television series and films used the term ‘warp drive’ to describe their method of faster-than-light travel. Neither the Alcubierre theory, nor anything similar, existed when the series was conceived – the term ‘warp drive’ and general concept originated with John W. Campbell’s 1931 science fiction novel *Islands of Space*. Alcubierre stated in an email to William Shatner that his theory was directly inspired by the term used in the show and references the ‘warp drive of science fiction’ in his 1994 article. The 1975 *Star Trek Star Fleet Technical Manual* suggests that the essential concept is the same as that later proposed by Alcubierre.” – from Wikipedia article, “Alcubierre Drive,” captured September 5, 2019.
 - ✓ See EM Drive and Alcubierre Warp Drive excerpts, Movement, *infra*.
- Ten Million Year Leap: It seems a likely possibility that in order to travel at FTL speeds, humans would first have to become *something else* ... that the current form of humanity is not suited to interstellar travel and colonization. That is, there may be an epochal connection between *FTL travel* and *trans-human evolution*.
 - ✓ In the 2018 short story “The Lantern” by Exurb (aka, Exurb1a, available in audio on YouTube, 14 minutes), Lanterns are humans who are intentionally mutated specially to function in ‘E-space’ which human ships use in transit between the stars. In E-space, neither human minds or computers work normally, so human passengers are

cryogenically frozen and the ships are manually steered and controlled by Lanterns (they are no longer human really), who sit in the forward bubble of the ship. Lanterns can see past and future by virtue of their mutation and exposure to E-space, human interstellar culture entirely depends on them. The Lantern in the story indicates that humans will not need Lanterns in about 3,000 years.⁵

If any higher SQ (Sentience Quotient) extraterrestrial (in our dimension) or extradimensional intelligences are watching, the invention of technology allowing faster-than-light travel by humans would be comparable to the spontaneous invention of an internal combustion engine by a toddler. Or by someone from the year 1066 A.D. It is not impossible, it is just extremely, in the most extreme sense, unlikely. Perhaps a once in a ten-million year leap outside the potential energy well, a temporal alpha decay. Carl Sagan pointed out:

- ✓ “It is all a matter of time scale. An event that would be unthinkable in a hundred years may be inevitable in a hundred million.” (*Cosmos*, p. 73).⁶

And the universe is over 13 billion years old, the sun over 4 billion years. The universe is vast, how many interstellar civilizations are out there? Well, that depends on who you ask and how the Drake equations are modified and what assumptions are made,⁷ see *Primal States*, and EN 2, 6 *Beginnings*, pp. 61, 67 respectively, *supra*.

If humans invented stardrive anytime in the next million years – that would be about two million years after human predecessors began using (not making) fire – we’d likely be well ahead of the probability curve.

- ✓ Standing in 2019: We consider the events of 2000 years ago to be ancient history; in the West, in the year 19, the Roman Empire, just transformed from the Roman Republic two generations prior, was approaching its zenith, Augustus Caesar had died five years prior, Roman expansion had been stopped at the Battle of Teutoburg Forest ten years prior. And the 19 year old Jesus was wandering around Roman Palestine. Ten thousand years ago is the dim twilight of history which we know with fair certainty, and much of that comes from archeology rather than contemporary recorded history. If it takes another 10,000 years for humanity to invent stardrive, and reach what GGDM calls the 1st Era of interstellar culture, what will our time seem like to those people, wherever they happen to be living in the solar system?
- Trans-human Touchdown: Kate Becker may have inadvertently suggested a path for human epochal evolution in her July 28, 2014 article, “Is Quantum Intuition Possible?” on NOVA discussing how babies learn intuitively the physics of our world:
 - ✓ “These innate notions, plus ‘elaborations’ born from watching and interacting with the world, add up to a sort of ‘naïve physics’ that we all grasp without any formal physics training, says [Kristy] vanMarle [University of Missouri]. But what about building quantum intuition after that early mental groundwork has already been laid?”

Of necessity it must also be true that any animal, especially of the higher orders, obtains “a sort of ‘naïve physics’” of the world in which they live, especially predators and their prey. This must be the co-defining mark of ‘progress’ or increasing neural complexity along both the sentience and sapience axes (plural of axis). Viewed in this way, it is remarkable that humans have only in the last four centuries passed beyond “a sort of ‘naïve physics’” as a spe-

cies, noting though that ancients had impressive engineering skills and used projectile weapons, such as catapults, and so possessed visionary application of “a sort of ‘naïve physics.’” It is now the place of humanity that we have arrived after the sudden spurt of formalized understanding able to imagine the quantum world, though having some trouble framing it.

- ✓ Continuing, she states, “To get from Aristotle to Newton, you have to be able to imagine a world without friction. Luckily, that isn’t so hard; if you’ve ever played air hockey or laced up ice skates, you can vouch for Newton’s first law. But what is the quantum equivalent of an air hockey table – an everyday object that provides us hands-on access to quantum physics?” *Id.*

- See full feature quote, 4 Colleges, p. 505, *supra*.

Thus, one might expect an epochal transformation of humanity – and no one can possibly predict the ramifications across our civilization, it would be as profound as reproductive consciousness or learning to make fire – when humans gain an intuitive understanding of the quantum in the same way we play air-hockey or intuitively understand the Classical Physics from the time we were infants. This is not at all impossible, as Albert Einstein hinted at the Bad-Nauheim debate in 1920 while dismissing illustrativeness in physics:

- ✓ “I would like to say, that what humans consider as illustrative or not, has changed. The view about illustrativeness is so to speak a function of time. I’m of the opinion, that physics is conceptual, not illustrative. As an example for the changing view about illustrativeness, I remind you of the view on illustrativeness of Galilean mechanics in different periods.” – Albert Einstein, Bad Nauheim Debate (1920).
- ✓ See further, Peek-a-Boo discussion, 2 Expansion, p. 893, *infra* and also human intuition discussion in You Already Knew It, 4 Colleges, p. 505, *supra*.

It would be interesting to see truly post-transhuman fiction (other than Frederik Pohl’s classic New Wave short story, “Day Million”) that describes the universe of human descendants who would legitimately regard us as Australopithecus (or babies). It is difficult to describe such a world, it would be like a blind-from-birth man describing seeing. The closest I have seen to this concept are the Therians’ “hyperlife” from the game AT-43, and the Mindjammer RPG setting, the New Commonality of Humankind (Mindjammer and Eclipse Phase were groundbreaking trans-human RPGs). GGDM does not address this epochal transformation; instead taking the convenient, well-trodden paths of standard science-fiction trope.

- Humans Advance Swiftly: To avoid addressing the epochal transformation or millions of years of sublight travel, and to keep the story accessible to the audience, science-fiction writers usually take the highly unlikely ‘temporal alpha decay’ above to give humans FTL. This is evident in the Stargate SG-1 series where an advanced alien visitor insisted that humans (with late 1980s early 1990s technology) could not have learned to operate the Stargate on their own, it is also the backbone of Star Trek, e.g., Cochran’s invention of the Warp Drive, and dozens of (in fact, nearly all other) science-fiction stories involving humans, technological alien civilizations and interstellar civilization. This also provides the credible intellectual basis for human adventurers to radically upset the existing galactic order, become a threat to the universe, and prove more dangerous and intelligent than all other races combined.

- ✓ “For every species bar one, Medieval Stasis is how the world works. Changes in technology and society take hundreds of years, and any existing alien civilization or

elf kingdom today looks more or less the same as it did a century ago – or will in a century more. For most races in the setting, slow change is the norm. The great exception are humans. Somehow these talking plains apes, who have only learned to walk fully upright a few hundred thousand years ago, have mastered technology and civilization in a fraction of the time it took everyone else, despite their incredibly short individual lifespans. Or maybe it is that very brevity that drives humans, the sense that they don't have decades to spare and need to accomplish things now. Or the rapid generational turnover means that once we become set in our ways we don't last long enough to impose our views on successors still young enough to be open-minded to new ideas.” – TV Tropes.com article, “Humans Advance Swiftly.”

All of this is a continuation of the “European mania for tinkering” (see David Landes excerpt, Eras, *supra*) and exploration that became science, technology and expresses itself in science-fiction colonization.⁸ It is not surprising then that science-fiction literature not do well outside the West, with the exception of Japan, because Western science-fiction genre does not have a basis in their cultures. Many thus see science-fiction genre as a continued form of racism and/or global enculturation of European ideals, with the stories and settings replaying 17th-19th Century European exploration, colonialism, and East-West relations and Western-African relations. In this milieu, Japan occupies a peculiar place, a continued legacy of the Meiji Restoration program, it has embraced Western science, technology and business-manufacturing ideas (and science-fiction), a secular government was imposed after WWII, but remains otherwise, culturally xenophobic and suspicious of foreigners and foreign ideas, and remains one the most racially and ethnically homogenous populations on Earth.

- ✓ I have read somewhere in a news article, an allegation that Japan is one of the last major nations on Earth that has not addressed racism, and this is because of the factors outlined above.

“Nor did science fiction’s refusal to champion a collective prescription for a space program vitiate its successful social role as a major spiritual and even mystical inspiration for Project Apollo. For while science fiction never did predict the details of Project Apollo, let alone champion anything so apparently ludicrous as going to the Moon via brute-force rocketry directly from the surface of the Earth without building an orbital space station first, many were the astronauts and space scientists whose careers were set in motion by its multiple visions of space-faring futures.”

– Norman Spinrad, [Science Fiction in the Real World](#) (1990), p. 124

Starship Scale: Undoubtedly, most participants of this game will envision human-scale starships – the kind usually featured in science-fiction movies and television programs. Such ships approximate the size of the largest oceangoing tankers on Earth, with some variation. At that size, such ships could presumably land on a planet surface without too much disruption, if built for atmospheric entry and landing. *Most Starships in GGDM are not assumed to be able to land on planets.*

Human imaginations are limited by first, our body size, and second, by our appreciation of the resources available *on Earth* currently, and consequently, a general lack of understanding of the

resources available in space (the metallic asteroid Psyche 16 is but a pittance) and the exponential power of future advances in manufacturing, and manufacturing in space.

- ✓ I recall a quote in a hypothetical starship discussion, which I cannot now place, that ‘a starship will only be as big as it needs to be’ on the theory that resources to build are scarce (and no need to create extra maintenance problems either). This must be embedded in sci-fi lore somewhere because I have seen various examples of starships scaled to creatures that are larger than a human or in the case of the First Contact short story “Meteor” (1956) by John Wyndham, much smaller. It *could be* a sign of Cosmic Impracticality (see 3 Entropy, p. 248, *supra*) to build monumental vessels that exceed the size of the species (like the 100 ft. tall Egyptian temple columns), in fact, the Goa’uld ships in Stargate SG-1 are fittingly built like Egyptian temples.

Examples of enormous (by our standards) starships are of course, the moon-sized Death Stars in Star Wars, SDF Macross (more than a kilometer long, but much less than a mile long, more than twice the size of the world’s largest tanker), the Magogg World Ship that consisted of 20 planets joined around an artificial star, armed with swarm ships and a weapon firing mini-black holes,⁹ and also the solar-system-sized ship which Galactus encountered in the last issue of Epic Magazine:¹⁰ Galactus was flying through the interior of the ship at the speed of light or more!¹¹ Like a housefly. And all of them are but a bubble of metal and air in the galactic or cosmic space; if you have ever been out in the middle of the Pacific Ocean on a ship, you will understand.

- ✓ The Space Battleship Yamato in Star Blazers (1979-1984) is exactly the size of a very large WWII era battleship – because it is the resurrected, refitted, refurbished IJN Yamato that was sunk April 1945. Who’d have thunk it? Set in the year 2199, the Yamato has been laying at the bottom of the ocean for 254 years (needs cleaning)... in the animated series I watched as a teen, the oceans have dried up exposing the ship, but the live action movie trailer (2010) shows the ship rising from the deep ocean with massive fighter escorts, and effortlessly making a vertical climb to orbit.¹²
- ✓ Though I cannot remember the sources now, I recall seeing something about a starship constructed from the mass of three galaxies (way beyond the scope of GGDM) and another, probably anime, series featuring ‘system cruisers’ which could hit any planet or ship in a nearby starsystem without moving (the point of this was that extreme long range weaponry changed the military dynamics, balance of power).

Ship sizes may be limited in Star Drive systems that are or require physical jump gates, such as those in the Buck Rogers and Babylon 5 television series. The corny Buck Rogers television series in 1979-1980 used the term ‘stargate’ for their local Earth Federation warp-point, which predates the 1994 movie of the same name. Babylon 5 featured both Jump Gates – technology that the humans got from contact with the Centauri who probably got the technology from elsewhere – and certain very powerful warships that could open their own jump points to and from hyperspace without a Gate. Babylon 5 is perhaps a little inconsistent on this point, but in the Babylon 5 movie, “Thirdspace,” they mention having to “widen the struts” on the Jump Gate to drag an enormous alien artifact through that they found adrift in hyperspace, indicating that there are ship size limits for the Jump Gates.

- ✓ However, stargate size may not limit starship size if it assumed that the ship shrinks or compresses when entering or being accelerated through the gate. This seemed

have been implied in the 2010 German indie sci-fi movie *Nydenion* when the enormous battleship emerged through the stargate. This could be the difference between ships of different Eras using the same Stardrive Patent.

“Beneath all this gaiety and baroque complexity lay the simple and so carefully denied: beyond the thin metal surrounding us was the endless humourless void. Hollow rings the laughter of orphans in the night.”

– Norman Spinrad, *The Void Captain’s Tale* (1982), pp. 167-168, Kindle Ed.

Stardrive Patent: A Stardrive is not a Physical Item Technology (PIT) because it is not a ship or installation, rather it is part of a ship.

- ✓ A Stardrive might in some cases, approach the status of a Technological Device (TD), for example, if some limitation of one Stardrive per system were in place, however, Stardrives (however expensive) are generally meant to be mass manufactured and more common than singular Technological Devices (if there were only one Stardrive in existence, it might be a Technological Device, but in space opera that is not likely).
- ✓ A Stardrive is not an Enhancement Technology, you cannot just strap one on the back of the space shuttle and fly to Alpha Centuri and then discard it.
- ✓ And a Stardrive is not a Continuous Operational Technology, because it is far from a ‘minor’ upgrade to an existing system.

A Stardrive is special, it is the core technology of interstellar culture – a propulsion system capable of moving living creatures and cargo to other stars in an efficient and timely manner (relatively speaking☺) and returning. Therefore, Stardrives are defined in the game by use of a special type of Patent, the Stardrive Patent.¹³

- ✓ The stardrive is the essence of the starship, without it, you have a spaceship (or system boat or maybe ‘fighter’). Stardrive is the *thing* of space-opera fiction. Perhaps it is too much of a metaphorical stretch, but would a Patent on fire have fit any of the Patent types? Fire was the *thing* of ur-civilization; humans made it a god (like a stardrive). The Patent process in GGDM is, of course, deeply flawed when compared to the real world, but it works for the in-game purpose for which it was designed.
- **Exclusion Principle:** While a position or a game may have many different Stardrive types (Stardrive Patents), each ship may have only one type of interstellar propulsion system and must be constructed with that drive system. Additionally, it will generally be prohibited for ships to be refitted with new types of Stardrives (when and if it is allowed, expect the cost to be quite high) and each ship may only have one unit of any type of Stardrive, both for eminently practical economic reasons. The basic assumption then in setting the cost of building any type of ship is that it will have only one Stardrive type and only one Stardrive unit (i.e., no stardrive redundancy), which is an integral and inseparable part of the ship and is built as the core of the ship at the time of construction. Carefully limited, very expensive, exceptions to these rules may be allowed by the Concierge.
 - ✓ “The [Pauli] Exclusion Principle is laid down purely for the benefit of the electrons themselves, who might be corrupted (and become dragons or demons) if allowed to associate too freely.” – Alan Turing (1954).

- And One Moving Violation: Positions are limited to successful prosecution of one Stardrive Patent per Era, except in the 1st Era *if* Generic Stardrive (GSD) was not acquired during the game setup process. Stardrive Patents may only be prosecuted in the current Era Matrix.

The GSD is required (as it is an Existential Patent, see Event Horizon 1 Eras, p. 760, *supra*) to progress to the 2nd Era, but does not exclude prosecution of another Stardrive Patent in the 1st Era. Thus, a 1st Era position could prosecute two Stardrive Patents, if it started the game without GSD, which would be an arduous task in the early game. Only one successful Stardrive Patent is required to advance to the 2nd Era, however. Stardrive Patents are not available as Advanced Patents, see 1 Eras, p. 763, *supra*.

“...it is the duty of the conscientious science fiction writer not to falsify what he believes to be known fact. It is an even more important function for him to suggest new paradigms, by suggesting to the reader, over and over again, that X, Y, and Z are possible. Every time a story appears with a faster-than-light drive, it expresses somebody’s faith – maybe not the writer’s; but certainly many of the readers’ – that such a thing may be accomplishable, and some day will be accomplished. Well, we have a lot of hardware – including, I’m sorry to say, a couple of old beer cans – on the moon right now, to show us what can be done with repeated suggestion. I think it can be done philosophically on a far broader scale than we have ever managed to do before.”

– James Blish, [The Tale that Wags the God](#) (1987) (Kindle Loc. 620-626) ¹⁴

Endnotes.

¹ Citation: See full feature quote, 2 The Sidereal Stage, bottom p. 120, *supra*.

² Commentary: The 1970s board game, Starfall, had an interesting FTL system; ships were divided into Pi (π) Ships and Infinity (∞) Ships. Pi Ships were attuned to local space and could move only within their sectors, while Infinity Ships were very expensive but could transit from sector to sector via wormholes (i.e. “starfall”). Exploration in the game was tedious, basically finding a wormhole, seeing where it came out, then mapping the entire sector looking for good planets. The 2011 board game, Eclipse also uses wormholes to connect the sectors, but all ships can travel via wormhole, and the way the sectors are laid out in rings doesn’t give a visual impression of wormhole connection.

³ Citation: In GGDM, this is called Maximum Habitability, see Dayworld, 3 Taxation & Census, p. 315, *supra*.

⁴ Commentary: Many movies that received bad reviews seemed like fine movies to me; many movies that receive awful reviews from the critics are positively received by the audience. Thus it is with Event Horizon (1997), which received awful reviews. There are probably two kinds of audiences, the horror/shock/gore audience and the sci-fi audience. I don’t watch movies to be shocked, scared or grossed out, so as a sci-fi fan, I thought Event Horizon was a good movie, I don’t mind adding a little horror to sci-fi films, but more gore would have made Event Horizon less appealing to me. The 30 minutes of lost footage would not have improved it.

⁵ Commentary: The story is derivative of Alfred Koppel’s “Rebel of Valkyr” (1950), the movie Arrival (2016), the Navigator Guild in Dune (1965), and the Void Pilots in Norman Spinrad’s Second Starfaring Age books (1983-1985). However it weaves the elements together in a convincing way presenting a new whole.

- ✓ *Spoiler alert*, I guess. Exurb1a does however leave an open question at the end: The Lantern admits that the futures he can see are probable, which then rules out pre-destiny – if there is a range of possibilities, there is no pre-destiny, you are on a road instead of a set of rails. Yet, he has gone back in time to recruit his past self to become the Lantern that he is in the future and seems to treat it as pre-destined. If he fails, if his past self chooses the other possible future, a paradox is created. On a personal level, it is non-harmful because it simply means the Lantern was never there to recruit himself – except (possibly) in the memory

of his past self who made a different choice (but if he wasn't ever there, is there a memory of it?). But to the human interstellar civilization, what about the potentially hundreds of transits he piloted that are now changed or un-happened? Which makes the reader wonder why Lanterns are allowed to go back and recruit their past selves? Yet, the Lantern describes it as a ritual of the Lanterns? As if they must finally prove to themselves that they were always going to become Lanterns? Like Mel Gibson going back in time to his own youth to convince himself that he was always going to be Mad Max?

⁶ Commentary & Citation: That is, unless FTL is actually, literally impossible... “But given infinite time, any non-impossible arrangement will happen.” – Matt O’Dowd (City University of New York), “Are You a Boltzmann Brain,” PBS Space-Time Channel, April 26, 2017. But what we understand right now doesn’t make it impossible.

⁷ Citation: A. Frank, W.T. Sullivan III, “A New Empirical Constraint on the Prevalence of Technological Species in the Universe,” *Astrobiology*, Vol. 16, No. 5, May 2016.

⁸ Citation & Commentary: The Chinese, of course, have their own word for ‘tinkering’:

- ✓ “Shanzhaiism (山寨主義) is a philosophical term denoting a Chinese style of innovation with a peasant mind-set. Shanzhaiism has an equivalent English term: tinker.” – from Wikipedia article, “Shanzhai,” January 25, 2019. The idea morphed into the term for counterfeit products: Shanzhai Products. “However, with shanzhaiism in mind, people can produce fake and counterfeit products in a massively organized way.” *Id.*
- ✓ In most civilizations of the past, foreigners were classless outsiders, troublemakers and often in status, lower than the peasants upon which the civilization depended for food, labor and military power. Shanzhai can also mean bandits: “Literally ‘mountain village’ or ‘mountain stronghold,’ the term refers to the mountain stockades of regional warlords or bandits, far away from official control.” *Id.*
- ✓ It is thus not a great extension that in China (e.g., ‘shanzhaiism’), tinkering was something peasants did naturally but the upper classes avoided. This played into their early perception of the “European mania for tinkering” (David Landes excerpt, Eras, *supra*) as the Europeans were outsiders, below peasants in status.
- ✓ Further, the Europeans created strongholds along the coast line of China and other places, and were often thought of as bandits and outside of official control. Thus, the entire early Chinese perception of Europeans possibly can be described in this one term.

⁹ Citation: Andromeda television series, generally.

¹⁰ Citation: Epic Illustrated, #34, February 1986, “The Last Galactus, Chapter 9.”

¹¹ Commentary: Consider that it takes light 8 minutes to reach the Earth from the Sun; Galactus found Nova inside the ship shortly after explosively breaching the hull.

¹² Citation: “Star Blazers The Movie – Teaser Trailer” (1:17) published on YouTube, July 27, 2010, has 1.6M views as of December 2016, including a few from me.☺

¹³ Commentary: Need jumpdrive? Strap a couple of lemmings to your starship... Sorry, you cannot un-read this!☺

¹⁴ Citation: “...here is a rough (and only partial) inventory of the stuff mankind has left on the moon: more than 70 spacecraft, including rovers, modules, and crashed orbiters, 5 American flags, 2 golf balls, 12 pairs of boots, TV cameras, film magazines, 96 bags of urine, feces, and vomit, numerous Hasselbad cameras and accessories, several improvised javelins, various hammers, tongs, rakes, and shovels, backpacks, insulating blankets, utility towels, used wet wipes, personal hygiene kits, empty packages of space food, a photograph of Apollo 16 astronaut Charles Duke’s family, a feather from Baggin, the Air Force Academy’s mascot falcon, used to conduct Apollo 15’s famous ‘hammer-feather drop’ experiment, a small aluminum sculpture, a tribute to the American and Soviet ‘fallen astronauts’ who died in the space race – left by the crew of Apollo 15, a patch from the never-launched Apollo 1 mission, which ended prematurely when flames engulfed the command module during a 1967 training exercise, killing three U.S. astronauts, a small silicon disk bearing goodwill messages from 73 world leaders, and left on the moon by the crew of Apollo 11, a silver pin, left by Apollo 12 astronaut Alan Bean, a medal honoring Soviet cosmonauts Vladimir Komarov and Yuri Gagarin, a cast golden olive branch left by the crew of Apollo 11.... One other earthly object that resides on that landscape is an urn containing the ashes of Eugene Shoemaker, the famed planetary geologist who dreamed, during his life, of going to the moon.” – Megan Garber, “The Trash We’ve Left on the Moon,” *The Atlantic*, December 19, 2012.