

SFX: Countdown

You're listening to Imaginary Worlds, a show about how we create them and why we suspend our disbelief, I'm Eric Molinsky.

Back in 2021, I was pretty riveted by this story.

CLIP: Science fiction became science fact for actor William Shatner today. At 90 years old Star Trek's Captain Kirk became the oldest person to travel to space.

Un, okay, was actually Admiral Kirk by the end, but anyway, putting that aside, this really was an amazing moment -- science fiction becoming science fact. It was a feel good story as they stay in the media.

But when he came back to Earth, I was surprised by how emotionally shaken he was. I mean, I didn't expect him to be the swashbuckling, galaxy hoping, James T. Kirk. But this was his reaction to seeing outer space with his own eyes.

SHATNER: So quickly, 50 miles

BEZOS: And you're in blackness.

SHATNER: And you're in death.

BEZOS: This is life

SHATNER: This is life, and that's death. And in an instant, you're like, woah! That's death!

That other voice is Jeff Bezos. Shatner went to space on his rocket, Blue Origin. When Shatner is talking about seeing death in space, Bezos is nodding and smiling sometimes. And at one point, he interrupts Shatner to grab a bottle of champagne.

BEZOS: Here, you want a little of this? Here! (Cheers)

As Bezos and the rest of this team is celebrating, Shatner looks away. The video went viral. The headlines used words like cringe and awkward. And I wondered if in that moment, Bezos couldn't see the difference between Shatner the person in front of him and Shatner the cultural icon.

Because Jeff Bezos is a huge Star Trek fan. In fact, he begged Paramount to put him in the franchise. And he got a one-second cameo as an alien under heavy make-up in the 2016 film Star Trek Beyond. And of course Elon Musk and Richard

Branson – these other billionaires who are pushing into space -- they're also sci-fi fans.

Now, a lot of scientists were inspired by Star Trek. Eric Primm is an engineer at Boeing. And he's written about spacecraft design in movies and TV shows.

ERIC: Some of my fondest memories are watching Star Trek: The Next Generation with my father, and thinking that when I grew up, this is what's, what the world was going to be like, my naive, you know, naive little sense. But looking at science fiction, looking at space and particularly spaceships, we can, for lack of a better term, surpass the boundaries of our home. We can grow, we can be more than just the planet killing species we currently are.

In previous episodes, I've looked at the disconnect between science fiction and science fact -- whether it's A.I., The Internet, or the Metaverse. And generally speaking, I don't believe that science fiction should be in the business of predicting technology. I think sci-fi is better at asking deep questions about who we are, and what new technology could reveal about ourselves.

But Eric thinks sci-fi about space travel does have a role to play in pushing science forward, whether it's Star Trek or The Expanse, which we'll talk about later.

ERIC: As technology catches up, as technology evolves, it's possible that we will get these ships someday. And hopefully there's some kid out there watching The Expanse and they think, man, maybe I could build that. Maybe I could design it. Maybe I could be the one that figures out how we are able to shake off this world and get out there into the solar system.

Science fiction has also been an inspiration for Jessie Christiansen. She's an astrophysicist at the NASA Exoplanet Science Institute. In fact, science fiction is so alluring, she feels frustrated by the limits of our current technology.

JESSIE: Like in 10,000 years I think humanity will be a spacefaring species. Right now, we need to keep the hope alive that we will be an interstellar species. Because I believe we will. There's this saying that we're the generation that's born too late to explore Earth, but too soon to explore space. So even if we don't think the physics is on our side in this particular case, coming up with ideas to how to do it and what it would look like and telling stories about the kinds of adventures that you would have, I think that's just an outlet for a deep well of need inside us.

So, if we do become a spacefaring species, what would we travel in? What would happen if you put not William Shatner in space, but The Enterprise? Does that design make sense? If not, what famous ships from TV shows and movies would work in deep space? The answers might surprise you. We'll lift off after the break.

BREAK

I mentioned before that a lot of scientists have been inspired by science fiction. That relationship goes both ways. It's becoming increasingly common for Hollywood studios to hire scientists as consultants on their products.

Kevin Hand is a planetary scientist at JPL, NASA's Jet Propulsion Laboratory. He's consulted on several TV shows and movies, like Thor and Avatar.

KEVIN: Let's see, on Avatar, I helped out a bit with the instrumentation used on, on Pandora to, to look for Life.

He also consulted on The Foundation series for Apple TV, which is based on the novels by Isaac Asimov. The creators of the show wanted to know how their big ships could jump in space and time. Kevin suggested two rotating rings at the center of the ships.

CLIP: FOUNDATION SFX

KEVIN: And so, the way, the way they work is that you've got at the center, these two rotating rings that, uh, generate the warp in space time. With that warp in space time created, then you can do the, the jump. And that's contrast with say, uh, as much as I love the Millennium Falcon, uh, classic spacecraft that, um, uh, many of us know and love, when you think about it going warp speed, it speeds up like, like a race car would, and eventually you get streaming of the, of the lights and, and you're going very fast.

C3PO: You did it!

SFX: JUMP TO LIGHTSPEED SFX

KEVIN: That to us makes sense, right? If we want to go very fast, we speed up, we accelerate. Whereas the reality is, if you are going to jump through space and time, you're, you're not actually going to bother accelerating. You're just going to create that warp in space so that you can jump through space and time.

I think Star Wars is interesting to look at because for many people my age -- and the age of many scientists and engineers out there -- these ships captured our imaginations as children. Eric Primm was a Star Wars fan growing up, but as an engineer today, the design of The Millennium Falcon kind of bugs him.

ERIC: The Millennium Falcon, it looks good, but it has kind of a gap in the middle. It's got squared edges. Those would really create drag.

With those squared edges, it might not have been able to make the Kessel Run in less than 12 parsecs. Sorry, Han!

Also, the Millennium Falcon -- like a lot of ships in Star Wars -- can easily go from the surface of a planet to space and back again. That happens all the time with The Mandalorian.

MANDLORIAN: Let's see what she's got.

SFX: FLYING

ERIC: That's one thing that always sticks in my craw because there is, in, in space, there's no friction. As soon as you enter the atmosphere, there is a large amount of friction.

That's Jessie's pet peeve too.

JESSE: Whenever they take a spaceship into earth's atmosphere to like land it. that's when I get taken out and I'm like, no, no, no, don't take them into an atmosphere!
<laugh>

Kevin says that is a common mistake in science fiction. They imagine that spaceships could be like fighter jets that don't have any altitude limits.

KEVIN: One of the things that is a, a sort of standard flaw is does this spacecraft really need to look anything like an airplane? Uh, that, that is kind of where, uh, spacecraft design often goes wrong.

Take the X-Wing fighter.

PILOT: Lock into attack position:

CLIP: X-WING SFX

**You know that cool moment where the X-Wing opens its wings to go into battle?
Eric says:**

ERIC: I love the X-Wing, don't get me wrong, but we don't need wings in space. Like for me, the X-Wing should be drones, right?

A drone fighter would be easier to maneuver. It would be lighter to store in your space hanger. And you wouldn't put the lives of your crew at risk.

ERIC: It's extremely risky to have humans piloting your fighter aircraft, especially in space.

Another thing that bugs Eric about the ships in Star Wars -- they have lots of windows. I think about the cockpit of the Millennium Falcon. It looks like a bomber from World War II. And when Eric looks at that glass -- he winces.

ERIC: In space everything is moving really fast. If there's any little bit of dust or junk or a micro meteorite, it has a chance of puncturing through. A fleck of paint can do damage at the speeds we're talking.

SFX: DEBRIS HITTING COCKPIT AND EXPLODING

The idea that a tiny speck of debris could smash open your cockpit window is disturbing -- it's very different from a movie like Infinity War, where Thor -- when he's floating in space unconscious -- accidentally smacks up against the giant windshield of the Guardians of the Galaxy spaceship.

SFX: SMACK AGAINST GLASS

ROCKET: Wipe it! Wipe it! Get it off!

But Jessie says we shouldn't write off glass entirely.

JESSIE: So, think of the things we've built, right? Like the shuttle has glass, the International Space Station has a couple of it, everyone's taking those gorgeous of pictures of Earth out. We're, we're human. We want to see. We want to explore. The whole point of building these spaceships is so that we can see new places and go new places. We understand the physics involved in making that glass thick enough and you know, robust enough. Is it a failure point? Yes. Is it something that we want? Yes.
<laugh>

To that point, according to Star Wars canon, what looks like glass is actually a fictional material called transparisteel. Star Trek has its own version of super strong glass called Transparent Aluminum.

A lot of ships in Star Trek have windows, including the viewscreen on the bridge – although in many versions of the show, the viewscreen is a digital display. Either way, Kevin says, the idea of the bridge itself is an anachronism.

KEVIN: That comes from the way Navy ships are operating. You've got a bridge high up, uh, where you can see out and, and look upon the, the, the sea and it's majestic from the standpoint of how to think about our exploration of the stars. And it works well for TV and film. Fast forward, centuries from now, any central command area within a spaceship is almost certainly going to have a robust centralized command center as opposed to an exposed exterior command center.

In other words, you don't want to put your command center perched on top. It's vulnerable to getting hit by debris or enemy fire. In Star Trek, they have force fields that protect. But the vulnerability of the shields is a storyline in every version of Star Trek going back to the beginning.

KIRK: Can we take it Mr. Scott?

SCOTTY; That's problematical, sir.

SFX: EXPLOSION

SPOCK: Captain, shields are down, we cannot survive another hit.

Assuming we don't develop protective force fields, it makes more sense to design future spacecraft like a combination of submarines and aircraft carriers. You know what show got that right? The reboot of Battlestar Galactica.

OFFICER: Condition One is set, all decks ready for action, sir.

ADAMA: Very well.

ERIC: Battlestar Galactica, I think really kind of gets that with burying everything in the center of the ships.

Again, Eric Primm.

ERIC: In my ideal design, I would start with Battlestar Galactica, and I would put all the human occupied spaces in the middle. Obviously the, the hanger would have to hang off the side so they can get the drones out. And then I would pack all the supplies

around the human side so that between space, there was also kind of sacrificial layers of compartments in order to protect in the case of hole punctures. Once we're out in space, we're, we only have the atmosphere that we're bringing with us, right? We can't afford to lose any of that. And so, protecting that atmosphere, keeping it inside the ship is going to be pretty much paramount safety-wise.

The Battlestar Galactica is a bulky-looking ship. The most memorable part are the hangar bays which look like handles off the sides.

The most iconic ships in sci-fi are often made of basic geometric shapes. The X-Wing of course has the X shape. Star Destroyers look like giant triangle wedges. The Borg ship is a cube. And the original Enterprise looks like a flying saucer on top of a flashlight with tailfins. I asked Jessie, which geometric shapes would make the most sense in space?

JESSIE: Well, that's the cool thing about spaceships, right? You don't need to think about air resistance, for instance. You don't have to build them aerodynamically like a plane, right? You know, they're in the vacuum of space, they're going to go in the direction they go and there isn't air or matter to slow them down. So, you can get really interesting and funky with your shapes. In terms of what's the easiest, so, if you think about things that are easiest to maintain pressure and easiest to maintain temperature in something as simple as a sphere, right? A sphere is like equal pressure in all directions, equal temperature in all directions. You can build something really, really simple.

I mean, theoretically then is the most realistic ship in Star Wars, The Death Star?

JESSIE: I mean realistic in the sense that it's straightforward to build in a way that could survive in space. Yeah, you could, you could get a planet, a solar system wide fleet together and build a Death Star.

OBI WAN: That's no moon. That's a space station.

HAN: It's too big to be a space station.

More realistically, the ships in 2001: A Space Odyssey could give us a sense of what future ships could look like.

BBC ANCHOR: The crew of Discovery One consists of five men, and one of the latest generation of the H-A-L 9000 computers.

The ship where most of the action takes place is Discovery One. It has a huge sphere at one end, which is where the astronauts spend most of their time, and then there's a long tail leading to the engines.

JESSIE: Almost all of these ships you're going to build in space, right? Like this is not something you build on the ground and then try to launch. So again, you're really unconstrained by things like air resistance and even gravity, right? Like once you're assembling in space, you can put things together in ways that don't make sense on the ground, right? Like, there's nothing you could put this spacecraft down on. It doesn't have, you know, a landing gear or even a bottom.

But Jesse says there might be a problem with the design of Discovery One -- or The Enterprise. The engines are connected to the rest of the ship by a very long, thin material. That could make them vulnerable to being snapped off.

JESSIE: Like even in the vacuum of space, big things moving fast have inertia. And whenever you have to change the speed of your ship in space, the occupants will feel inertia and the materials of the ship will feel inertia. So thin bits can be worrying depending on how the ship slows down.

These big ships that we'd build in space would have smaller shuttles inside them that could land on planets or go to other ships. But they would have their own challenge in slowing down.

JESSIE: In order to talk about the speeds that we're talking about. You have to be going incredibly fast, just mind bogglingly fast, right? It's something that the human brain has trouble with. But if you need to turn around, you either have to slow down from that incredible speed, which is going to take a long time and then pivot. Or you need to do like an incredibly large arc in space, right? There's no, there's no U-turns in space at speed.

She says there are two shows that do a good job dealing with that issue. In both shows, space travel is seen as kind of grimy and kind of unglamorous. The first ship she's thinking about is Serenity from the show Firefly -- a beloved but short lived show that was like a Western in space.

CLIP: FIREFLY SFX ENGINES

JESSIE: And so, one of the things I liked about the Firefly design with these two engines is each engine could go forwards or backwards. So, you could kind of get more of a spin.

The other show is The Expanse. In The Expanse, humans have colonized the solar system and they're fighting each other over power and resources in space.

JESSIE: The Expanse did a really good job of dealing with the fact that you need to decelerate in space. Like it's a plot point in some of the episodes that if you decelerate too fast, you can die

CLIP: ENGINE SFX

Eric is also a fan.

ERIC: Oh, yeah, yeah. I really like The Expanse. One of the things that I always loved was they flipped the ship to slow down. They actually flip the ship, and they point their engines at their destination and fire the engines so that it slows down.

HOLDEN: Slow the Roci down, flip and burn her, hard as you can without that missile catching us.

ALEX: We are dead if I slow down!

HOLDEN: This is a risk we got to take. Hang on!

By the way, Jeff Bezos was also a huge fan of The Expanse. And he even saved it from cancellation by moving it to Amazon Prime.

The main ship in The Expanse is called The Rocinante. It's a beloved ship for fans because the crew becomes a found family. And like Battlestar Galactica, the control center is in the middle full of a lot of screens. It's not a bridge or a cockpit.

But off the top of my head, I can't remember what The Rocinante looks like from the outside. I just remember it being blocky. Kevin Hand says that's actually realistic.

KEVIN: Take a look at the International Space Station. The International Space Station is kind of a Capsela of construction. I, I think Capsela's long gone out of business, but at least when I was a kid, it was a variation on LEGOs where you have these little components that you, you stuck together. And our construction of craft in space, uh, so

far in terms of larger things has been with that kind of modularity. And the International Space Station, as amazing as it is, is not so much a reflection of one singular coherent design, but rather a need to allow for modularity as the Space Station grew. You know, eventually humanity, <laugh>, God willing, we survive long enough. Uh, eventually we will be able to build, uh, singular coherent, uh, spacecraft. But there will be a period of, of just strapping modules, one onto the other.

At NASA, Jessie's job is to find planets deep in the galaxy that we haven't learned about before. She can really only do that through data analysis, not even telescopes, but she's certainly thought about how we could get to these planets.

JESSIE: The only way we get there without breaking the laws of physics as we know it, is generation ships. So, you build a ship that's big enough that you can have tens or hundreds of generations of people live on it, because it's going to take you tens of thousands of years to get there. So, whenever I see a generation ship in science fiction, for instance, I'm like, yes. Okay, we're there, we're good.

That's another reason why she likes The Expanse. They have a generation ship that's so big, the characters call it The Behemoth. It looks like a giant cylinder with a needle on top.

JESSIE: And it's an incredible ship when you see it realized. And like for instance, one of the things that's really cool about it is it creates its own gravity by spinning. And one of the cool things they've discovered with astronauts who spend a long time in space is turns out humans actually need gravity. It's important and vital for the function of life.

CLIP: THE BEHEMOTH SPIN SFX

JESSIE: So, the Behemoth, it, it's like a big barrel. And at some point, in the show, in The Expanse, they started it spinning to create gravity. And this, this visual of this huge ship just slowly starting and starting to spin up until it can get to almost the equivalent of one Earth gravity is super cool. And you know, as a scientist watching it, you're like, yes, that's exactly what you would need to do. That's so cool.

Video games have also been pretty thoughtful in depicting what space travel might look like in the future, like in Halo or Mass Effect.

In the Mass Effect games, humans travel across the galaxy in ginormous ships which can carry thousands or millions of passengers.

SHEPARD: Look at the size of that ship.

CREWMEMBER: The essential flagship of the Citadel fleet.

JOKER: Citadel control, this is USS Normandy, requesting permission to land.

Eric enjoyed playing Mass Effect.

ERIC: I like those a lot. I believe that those are going to be necessary if we really want to travel distance.

The Citadel in Mass Effect is not just a space station with a landing dock. It's a planned community with restaurants, bars, government offices, apartments, and casinos. There are also talking aliens living and working among the humans, but putting that aside, Eric says the mundane aspects of these ships are fairly realistic.

ERIC: We'll need recreation, we'll need, um, we'll need variety of recreation too. We'll need, uh, all kinds of medical support. We'll need psychiatric support. We'll need food care; we'll want things for dating. Um, we'll want religious services of a variety of denominations. Because what is it they say in the army for like one soldier, you need like five support people. I mean, it's going to be the same thing in space, but probably even more.

When he was talking about making space travel feel comfortable and familiar, I thought about a scene from the last season of Picard. The crew of The Next Generation goes on board a replica of their outdated Enterprise, which is at a starship museum.

PICARD: It wasn't until this moment, reunited with all of you, I realized what I've missed most. The carpet. <laughing>

Yep, the Next Generation bridge had a red and gray carpet -- which I always liked, I found it very homey. But when I was talking with Eric, I joked about the carpet from The Next Generation, thinking that would not be in a future spaceship. But he says it's a smart idea.

ERIC: Carpets and all of that would need, would be necessary for our psychology. It would be necessary for trying to distract from the fact that we are living inside of a building for years, decades, maybe centuries on end.

Of all the things I was thinking in terms of space travel, I never thought carpeting would matter. But there is the old saying, “wherever you go, there you are.”

The fact is, none of us will live long enough to see humanity take this journey. And you heard, everyone I talked with has concerns that we could even last that long.

But they think it’s important for us to keep fantasizing about space travel – and not just to inspire future astronauts, scientists or engineers. Until we’re ready to fly people out into the galaxy to go exploring, what might get us there is thinking about ourselves as explorers – instead of just thinking about ourselves.

That’s it for this week. Thank you for listening.

Special thanks to Eric Primm, Kevin Hand and Jessie Christiansen, who is such a fan of spaceships, when she and her husband got married and they were labeling the tables:

JESSIE: Our wedding plan for where everyone would sit is an armada of science fiction and real spaceships. Uh, and my husband and I were in the TARDIS and then everybody got their own spaceship -- Firefly, Battlestar Galactica, the Millennium Falcon. And I remember my friends who were on the Cylons ship being like, wait, are we the baddies? <laugh>

CYLONS: Pursue and destroy.

SFX: FIREFIGHT

If you liked this episode, you should check out my 2017 episode about The Expanse, or my 2018 episode Living in Space. In that episode I looked at the history of The O’Neill cylinder. It’s a spaceship design that shows up in a lot of films like Interstellar. There are so many other ships we weren’t able to cover. Let us know some of your favorites and why on our social media pages.

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