

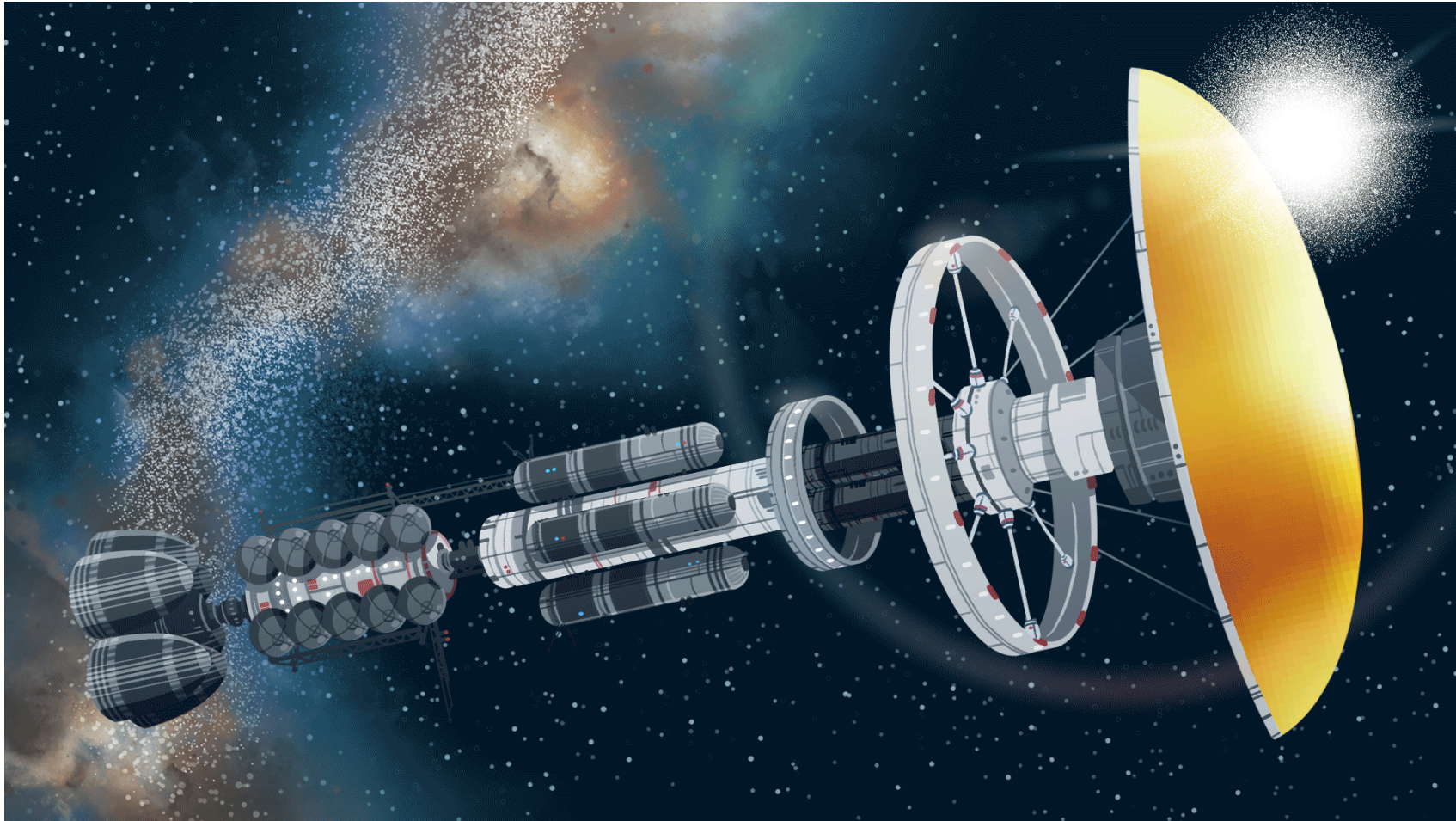
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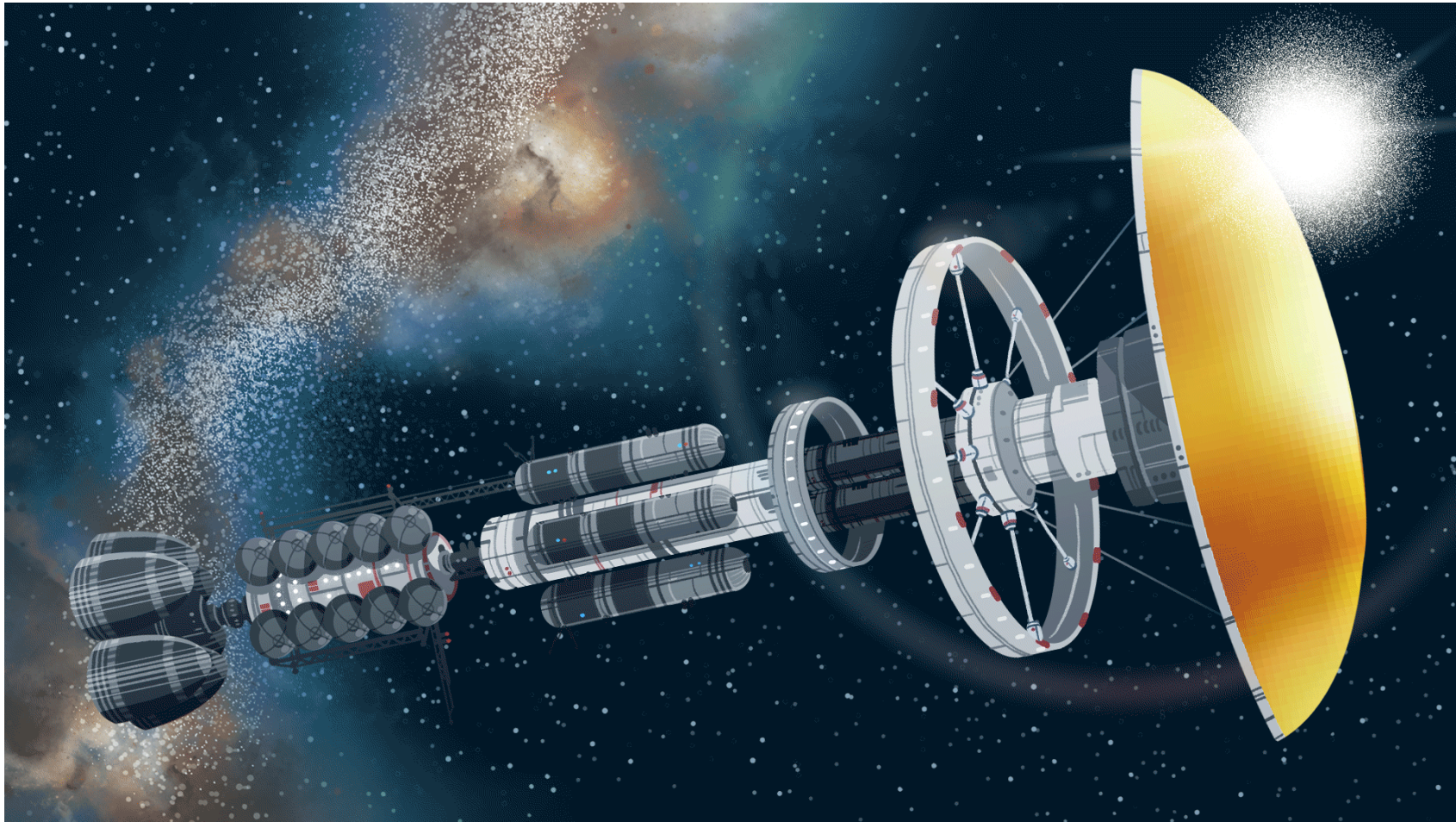
Dear 22nd century, have you given up on the interstellar dream?  
Dear 22nd century, have you given up on the interstellar dream?

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The interstellar dream is dying

Sending "generation ships" to colonize the cosmos makes less sense the more we look at it.

by [Chris Taylor](#)

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*NOTE FOR 2018 READERS: This is the fourth in a [series of open letters to the next century](#). The series marks a little-known chronological milestone. According to [UN data](#), life expectancy at birth in 18 countries now exceeds 82 years — meaning babies born in 2018 are more likely than not to see the year 2100.*

*What will the world be like at the other end of those kids' lives? Today's scientific discoveries, Silicon Valley visions, and science fiction can give us glimpses — and in this series of digital time capsules, we also recognize that our hopes and fears can shape what the future will become.*

..... ◆ .....  
**Dear 22nd century,**

I have no doubt that many of you have lived in, worked in, or at least visited space. To us, it seems likely you'll have at least one moon base, that you're mining [ridiculously mineral-rich asteroids](#), and that the long hard work of terraforming Mars has begun. You've probably set foot on the more interesting moons of Jupiter and Saturn. Space may even seem a bit mundane to you — the solar system variety, at least.

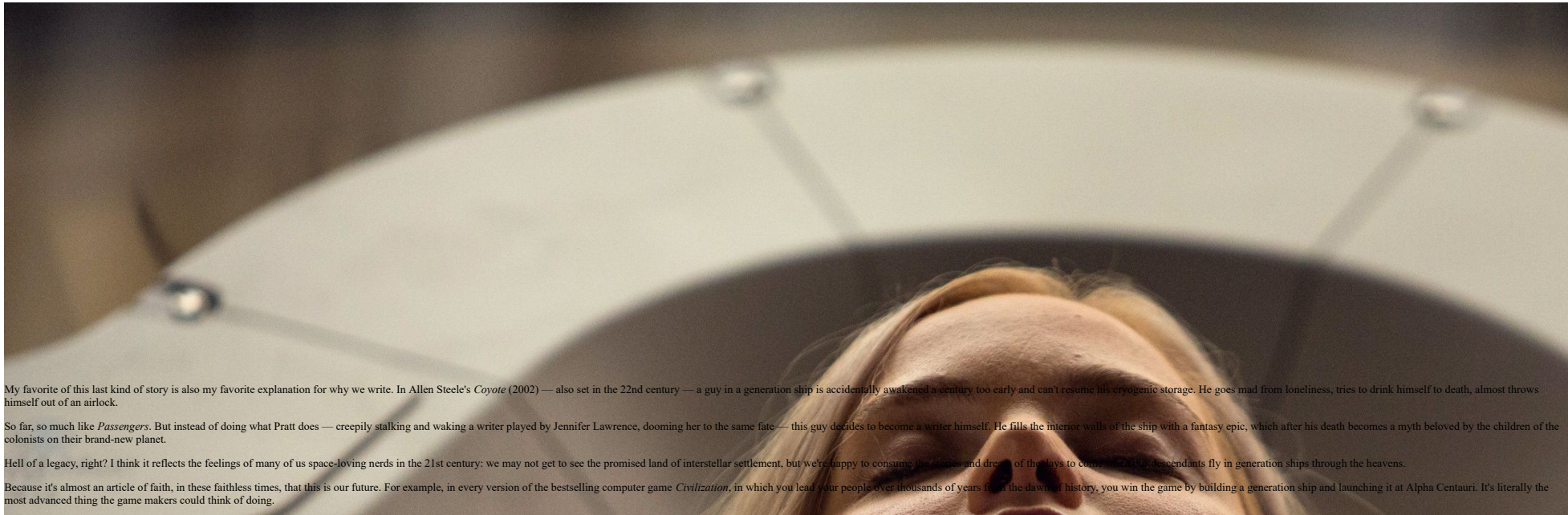
The real space question is this: Have you given up on the whole idea of traveling farther, of visiting or settling planets other than the ones in our solar system? I fear you have.

I'm not talking about the faster-than-light dream. The speed of light is likely just as impassable in your century as it is in ours. [Science fiction that says otherwise is mostly magical thinking](#). It's likely we can't even get close, given the titanic amounts of energy it takes to accelerate to even a fraction of the speed of light.

No way around it, each light year — or 6 trillion miles — will take decades to cross, and there are barely any stars in a 10-light year radius. We're in a celestial suburb. The only way humans have ever seriously considered getting to the realm of other star systems is in vast starships designed to run for a century or two. Because they would probably take multiple generations to reach their destination, space nerds call them generation ships.

But the last few years have not been kind to the generation ships dream. The science seems to be telling us that generation ships are a dream too far — and science fiction is starting to follow suit.

This is a wrenching thing to have to write. Tales of generation ships have fired my imagination for as long as I can remember. I love all the tropes — the ones where the Earth-like ships are so vast and old that the inhabitants, descendants of the original crew, have forgotten they're on their way to another star (such as Robert Heinlein's classic *Orphans of the Sky*, in which the vessel is launched in the 22nd century). Or the ones where the colonists are all in cryogenic storage and one is accidentally woken decades early (like Chris Pratt in the much-maligned 2016 movie *Passengers*).



My favorite of this last kind of story is also my favorite explanation for why we write. In Allen Steele's *Coyote* (2002) — also set in the 22nd century — a guy in a generation ship is accidentally awakened a century too early and can't resume his cryogenic storage. He goes mad from loneliness, tries to drink himself to death, almost throws himself out of an airlock.

So far, so much like *Passengers*. But instead of doing what Pratt does — creepily stalking and waking a writer played by Jennifer Lawrence, dooming her to the same fate — this guy decides to become a writer himself. He fills the interior walls of the ship with a fantasy epic, which after his death becomes a myth beloved by the children of the colonists on their brand-new planet.

Hell of a legacy, right? I think it reflects the feelings of many of us space-loving nerds in the 21st century: we may not get to see the promised land of interstellar settlement, but we're happy to consume the stories and dreams of the days to come while our descendants fly in generation ships through the heavens.

Because it's almost an article of faith, in these faithless times, that this is our future. For example, in every version of the bestselling computer game *Civilization*, in which you lead your people over thousands of years from the dawn of history, you win the game by building a generation ship and launching it at Alpha Centauri. It's literally the most advanced thing the game makers could think of doing.



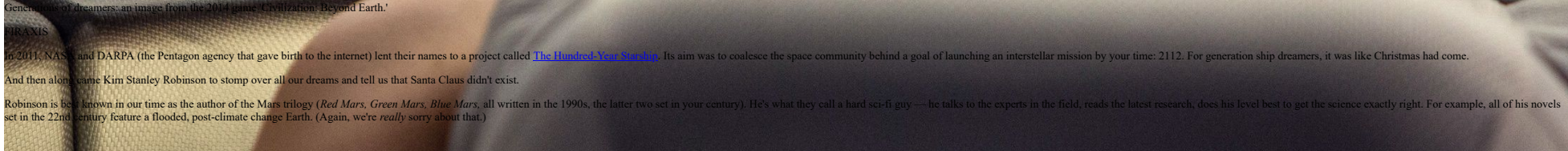
Generations of dreamers: an image from the 2014 game *Civilization: Beyond Earth*.

ORAXIS

In 2011, NASA and DARPA (the Pentagon agency that gave birth to the internet) lent their names to a project called [The Hundred Year Starship](#). Its aim was to coalesce the space community behind a goal of launching an interstellar mission by your time: 2112. For generation ship dreamers, it was like Christmas had come.

And then along came Kim Stanley Robinson to stomp over all our dreams and tell us that Santa Claus didn't exist.

Robinson is best known in our time as the author of the Mars trilogy (*Red Mars*, *Green Mars*, *Blue Mars*, all written in the 1990s, the latter two set in your century). He's what they call a hard sci-fi guy — he talks to the experts in the field, reads the latest research, does his level best to get the science exactly right. For example, all of his novels set in the 22nd century feature a flooded, post-climate change Earth. (Again, we're *really* sorry about that.)



Watching a Hundred-Year Starship conference incensed Robinson. "It was a combination of a scam and a religious meeting," he says, "presented with such an authoritative sheen, such pseudo-science." So he went to NASA Ames, discovered a lot of internal consternation about the agency's involvement with the project, talked actual planetary science with actual planetary scientists, and published *Aurora* in 2015.

*Aurora* was a nice drop of a book — not merely a rebuttal to decades of generation starship stories, but the ultimate case for why we couldn't and shouldn't try to settle a planet in another star system. It caused a feud between Robinson and elder science fiction authors that hasn't died down since.

"It was like the starship was made out of plastic, and I had a baseball bat, and I smashed it to smithereens," Robinson told me. "If people had not reacted in anger, I would have done something wrong. People think humanity going to the stars is a sign that our species has succeeded. But if it's impossible, if it will consistently fail, then there will be people standing around feeling like humanity is a failure. It needed to be said."



Kim Stanley Robinson's generation ship — simply called The Ship — as seen on the cover of *Aurora*.

ORBIT BOOKS/HACHETTE

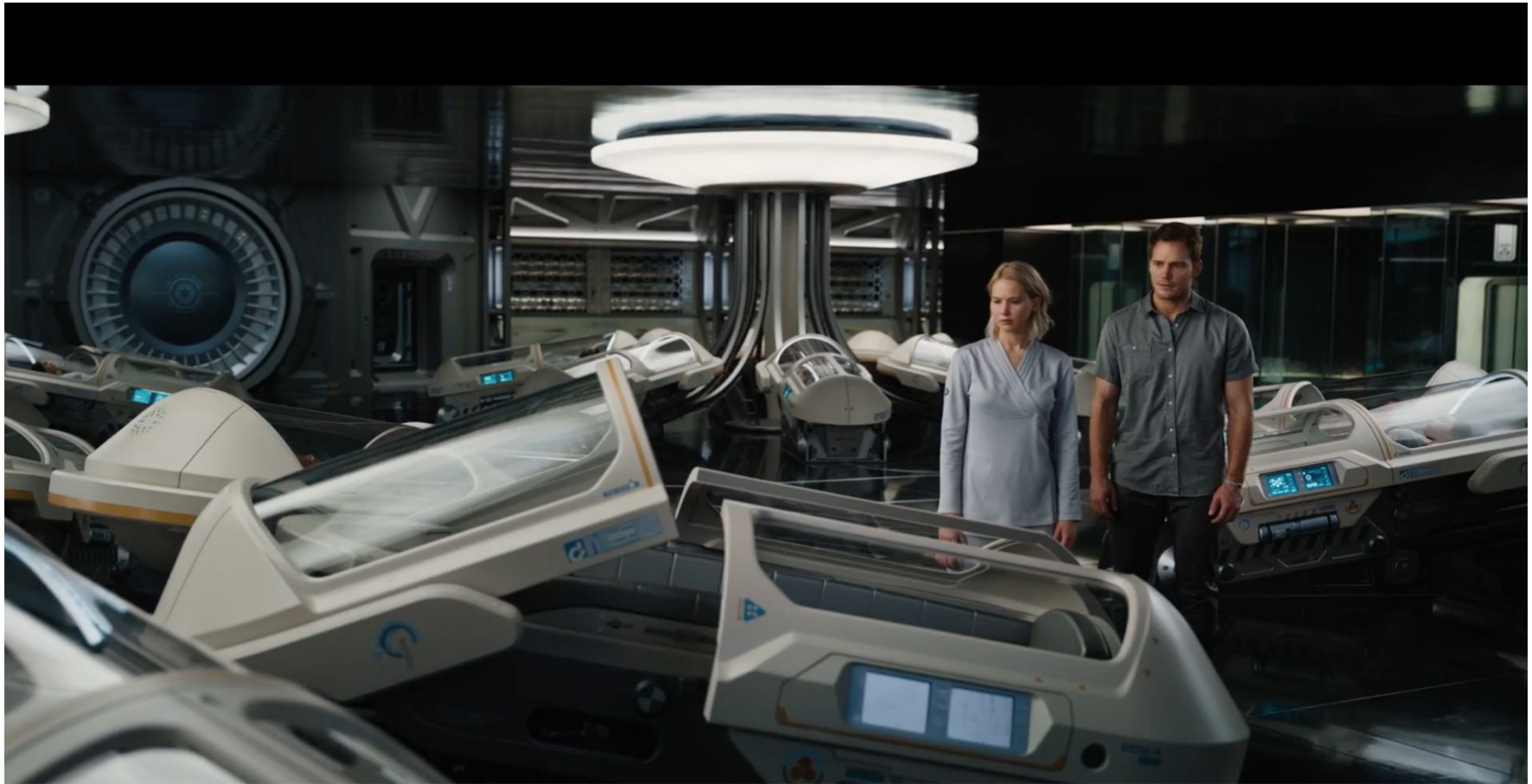
Because of all this, it's worth taking a little time to recap the first half of *Aurora*. (I'll try not to spoil too many of the details, but come on — depending on when you're reading this, you've had between 3 and 185 years to pick it up already.)

It starts with a generation ship getting close to Tau Ceti, which at 12 light years away is probably the nearest inhabitable star system. (In real life, we know now that Alpha Centauri is "a weird star with weird planets," Robinson says, and probably unsuitable for humans.) Robinson has given his ship every advantage: two rings full of vast biomes, a Noah's Ark full of every kind of Earth life, and a chief engineer who's a wiz at solving problems.

Still, problems persist. Stuff breaks down. It's a closed biological system, and the essential element phosphorus is leaking out of the soil somewhere — perhaps, the engineer muses, in the few grams of ash a family is allowed to keep when a loved one dies. Decelerating the ship as it arrives at Tau Ceti is as big a problem as accelerating it, and is putting all sorts of weird strains on the ship that its designers didn't anticipate. And the next generation of kids is noticeably sicker and less smart — probably a result of [the island effect](#).

The colonists arrive at the fourth moon of the fifth planet of Tau Ceti, which they name Aurora. It's Earth-like and oxygen-rich, but everything's a little bit off; they have to contend with near-constant 60 mph winds, a planet in the sky that makes everything way too bright at night, and week-long eclipses. The first arrivals get to work building shelters and grumble about wanting to take their helmets off — until someone rips their spacesuit, gets sick and promptly dies.

Pretty soon everyone's sick. Something's alive on the planet, something at the bacterial level, and nobody can identify it. Whatever's in the air or water of this alien planet, it remains beyond the reach of human science — and that's scarier than a thousand bug-eyed monsters.



Hibernation problems: Jennifer Lawrence and Chris Pratt in 'Passengers.'

SONY PICTURES

Back on the ship, a murderous argument breaks out between the people who want to leave Tau Ceti altogether and head back to Earth, and those who want to remain. (Think Brexit, but with more kidnappings.) A compromise is brokered, and here's where it gets heartbreaking. As the ecology on board continues to break down, those who head back to Earth are faced with the nightmare of famine — starvation, rations, eating their pets, suicides, the whole bit.

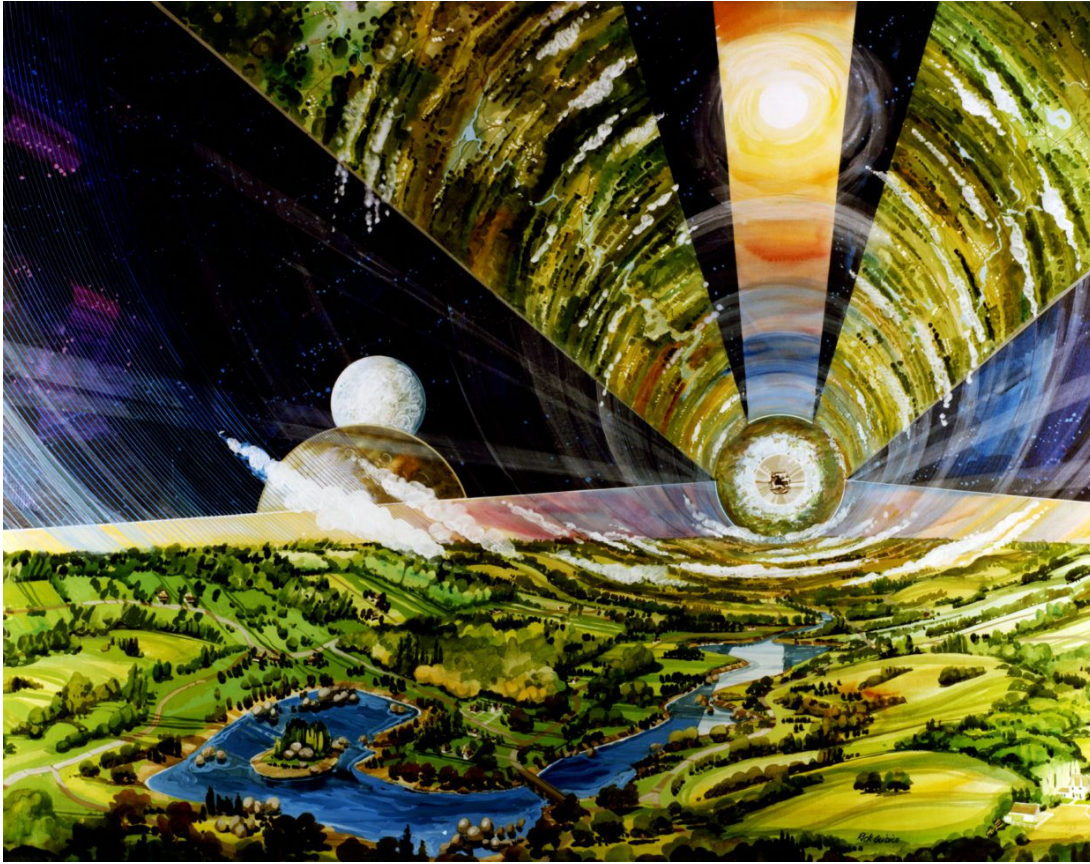
Just in time, news of new technology arrives via radio waves from Earth — not cryogenic storage, exactly, but slowing down the body's system enough that they can hibernate like bears. But that doesn't translate into perfect *Passengers*-style sleep. "Bears can and do die in hibernation," Robinson points out, ever the buzzkill. The difficult maneuvers the ship has to undertake in order to decelerate back home without shooting through the solar system and out the other side manages to kill a lot of hibernating humans, too.

Back on Earth, folks are blind to the difficulties the ship went through, and at a gathering not unlike the 100-year Starship conference (rather pointedly filled by men with beards), one guy insists on sending more ships out into the cosmos. One of Robinson's characters punches him in the face.

You can see why pro-colonization authors such as Gregory Benford [vehemently objected to \*Aurora\*](#). But they haven't been able to tear down its central argument: stuff breaks down. The second law of thermodynamics is unbreakable. You can't just put a closed system in space for a century and hope for the best.

And either the planet at the other end is dead, in which case we'll have to spend centuries terraforming it, or it's alive, and its unseen assassins could kill us in a hundred ways — just as the invaders in *War of the Worlds* were killed by Earth's bacteria.

I asked Robinson to respond to Benford's accusation, that he put his thumb on the scale to make interstellar colonization look as unworkable as possible. "Well, God put his thumb on the scale," he said.



An O'Neill cylinder from the 1970s book 'The High Frontier.' The same design has been suggested for the interior of generation ships.

WIKIMEDIA

In recent years, science has come down hard on Robison's side of the debate. And that's all thanks to some grisly experiments on mice.

First researchers blasted their little mouse brains with particles similar to cosmic rays, the kind that will bathe any astronaut on a deep space mission. [Result](#): the mice became noticeably slower, more forgetful, more confused. It's hard to escape the conclusion that space basically gives you dementia. Send a ship to Tau Ceti and you may not even have an engineer smart enough to fix all the problems by the end of the voyage.

Maybe we can clad our ships with enough protective material to keep our brains safe, but it's hard to keep cosmic rays at bay without Earth's protective magnetosphere. "There really is no escaping them," said the oncology researcher in charge of the study.

Besides, there's also a problem with our guts. Earlier this month, NASA published [more research](#) where mice were blasted with cosmic radiation, this time in their small intestines. Result: massive GI damage and tumors.

So much for ships that stay out of planetary magnetosphere range for a century or more. At this point, we're not even sure we can make it to Mars without giving astronauts cancer. No hibernation device is going to save you from a pre-existing disease.



Matthew McConaughey contemplates life in a space cylinder in 'Interstellar.'

PARAMOUNT

So is that it for the generation ships dream? Will you remember it as a quaint but unworkable sci-fi idea, like Jules Verne sending his fictional explorers to the moon via a giant cannon? Do we have to be content with remaining in our solar system unless a convenient wormhole to another one pops up, the way it did in *Interstellar*?

Kim Stanley Robinson would like to say yes. His position is that the whole concept is a distraction from the essential task of fixing Earth, our current and only starship. *Aurora* contains several translations of a single poem about how you have to learn to be less restless and more satisfied with living in one place, but they all boil down to one succinct phrase: "there is no Planet B."

But then again, as Robinson's environmental chemist wife Lisa Howland Newell gently chides him when he says this, "never say never. Never say impossible. You don't know."

Perhaps we can colonize other planets in the equivalent of a slow boat to China — a hollowed-out asteroid, with miles of rock providing the best possible cosmic ray protection. Robinson invented this form of transport, which he called Terraria, in another book, *2312*. If we could learn to be self-sufficient within Terraria, we could travel to the stars in them, albeit in thousands of years rather than hundreds.

There's the option of sending ships with DNA printers that could reconstruct human beings at the other end, although that too would require technology we don't currently have. Or perhaps we'll locate the perfect planet before we go by sending hundreds of so-called [StarChips](#) — tiny, lightweight sensors that could reach Tau Ceti in a matter of decades. Because you can go a lot faster when you don't have to take humans with you.

Regardless, there's one side of space Kim Stanley Robinson can't kill and doesn't even want to: the imaginary version. "The galaxy is a great story space in the same way that Middle Earth is a great story space," he says. "You don't have to give up on the galaxy. You can tell these stories, and you can do a little handwaving, and you can let your imagination roam — and you can say, look, this story takes place 20,000 years from now. Who the hell knows what we will have done in that time, if we're still around."

May you continue to create and consume tales of the galaxy for as long as you draw breath.

Yours in interstellar imagination,

2018

- Written by  
Chris Taylor
- Edited by  
Jen Doll and Keith Wagstaff

- Illustration by  
Bob Al-Greene